上海仁記路拾六號

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

遠東時報

MANCHURIA—THE DANGER SPOT OF ASIA

THE EXTRATERRITORIALITY COMMISSION

JAPANESE FINANCE AND TRADE

THE PORT OF TSINGTAO

IRON, COAL AND MINERAL OIL ON ASIATIC COAST OF PACIFIC OCEAN

MACHINERY MANUFACTURING INDUSTRY IN JAPAN

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IRON IN THE PHILIPPINES

Vol. XXI December, 1925 No. 12

SHANGHAI, PEKING, TOKYO AND MANILA

Reconstruction Number of The Far Eastern Review

PRESS REVIEWS

North-China Daily News:

An Echo of the Earthquake

The Reconstruction Number of the "Far Eastern Review," which has just come off the press, is one of the most remarkable publications ever issued in the Far East. Consisting of more than 400 large quarto pages, the magazine gives a fully illustrated and graphic account of the efforts of the Japanese Government and Japanese engineers to reconstruct Tokyo and Yokohama. Excellent reproductions of photographs depict the enormous damage done by the earthquake over a wide area and also the feats of reconstruction the Japanese have accomplished since. Although primarily of interest to engineers many others will feel that $5.00, at which price this special issue is sold, will be well invested in acquiring a copy. It is printed by *The North China Daily News* and is on sale at all booksellers.

Shipping and Engineering:

Mr. George Bronson Rea, Editor and Publisher of the *Far Eastern Review*, Shanghai, is heartily to be complimented on the Japanese Reconstruction Number of the Journal, which has just made its appearance, and which is probably the most valuable, interesting and praiseworthy issue of any periodical that has yet been printed in the Far East. Dedicated to the Japanese engineer, "whose monument will ever be the recreation of Tokyo and Yokohama after the terrible earthquake and fires had reduced those cities to veritable dust," this noteworthy issue of a monthly magazine which already stood in a class alone and apart, constitutes a printed and pictorial record of one of the mightiest industrial and engineering efforts in history—the reconstruction of Japan's capital and her largest port after one of the worst calamities in the records of mankind; and one cannot pay the *Far Eastern Review* a greater compliment than by saying that the Reconstruction Number is a worthy record and appreciation of the mighty effort its pages depict so well.

Hongkong Telegraph:

Japan's Reconstruction

It is now just two years since the greatest calamity that Japan had ever known in her history affected a large area of her most populous territory—destroying one of her large seaports and wrecking a great deal of her capital. There was terrible loss of life, and scenes of horror such as only a vast catastrophe can give rise to. The terrible effects of the great earthquake are still evident at both Yokohama and Tokyo, but a great amount of reconstruction work has been accomplished. In the comparatively short space of two years the Japanese engineers and their assistants have rebuilt much that had been destroyed, and it should not be long before practically all the broken achievements of the past are replaced. We are reminded of this achievement by the recent publication of a journal devoted to a description, graphically illustrated, of the feat that the reconstruction department has performed—and it is undoubtedly an accomplishment of which the Japanese nation can be justly proud.

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XXI SHANGHAI, DECEMBER, 1925 No. 12

Manchuria—the Danger Spot of Asia

Japan Must Protect Her Huge Investment in the Three Eastern Provinces—A Policy of Strict Neutrality in the Internal Affairs of China Cannot Endanger the Peace of Japan

Chang Tso-lin's Difficulties

IT is not often that a matter which is of local political interest in China is referred to in the columns of the *Far Eastern Review*. The situation which has development in Manchuria is so likely to lead to internal difficulties that every detail becomes of primary interest at the present time. During October a war developed between the Chekiang troops and the Fengtien soldiers in Kiangsu. Marshal Chang Tso-lin, who had won a victory during the last war (1924) found himself expanding not only beyond Manchuria but into south China. His army was not only occupied with Manchuria but extended into Kiangsu as far as Shanghai, holding a line from the Siberian frontier to the Yangtze River. It must be noted that many of his most experienced advisers suggested that his line was intensible. It must be noted that his Japanese military adviser is reported to have suggested to him that he was endangering the peace of Manchuria by expanding his forces beyond his powers. Nevertheless Marshal Chang continued to occupy and develop new territories. The war of this year is largely the result of this expansion. It is largely the result of an effort to unify China by force. The Fengtien troops were driven from Kiangsu and Shantung with hardly a fight, and then the most important part of that army rebelled because they objected to what they called Chang Tso-lin's imperialism.

Japan Neutral

It is an open secret in China, that Chang Tso-lin had counted on Japanese support because he believed that Japanese interests were so large in Manchuria that the Japanese would have to break their strict policy of non-interference in China's affairs to protect themselves against the possibilities of economic loss because of the disturbances in that part of the country. But the Japanese adhered to their policy of non-interference. They assisted neither Chang Tso-lin nor any other militarist in the country. They attended strictly to their own affairs. In due course, it would appear as though the great Manchurian warlord were to be defeated and a younger and more energetic element placed in control of the Chinese affairs of Manchuria.

Chang Tso-lin

The career of Marshal Chang Tso-lin is one of the most remarkable in China. He started in a small way in the hills of Fengtien and eventually worked his way into the army. From the lowliest position, he rose until he became the controlling power in the Three Eastern Provinces and the dominating power in Peking. He built up a huge military machine which made him the envy of other militarists and he gave the general impression of invincibility. No one discussed the probability of Chang Tso-lin's defeat; the question was rather: how far would he go? He gave to Manchuria an able administration, much of the credit for which, however, has to go the South Manchuria Railway and the administration of the Kwantung Leased Territory. During his tenure in office, Manchuria developed into one of the richest areas in China, the bean crop, the Fushun colleries, the wheat markets, the industrial and commercial enterprises attracted capital at a time when the remainder of China has been in disorder and the officials have been utilizing commerce only to tax it and to enrich themselves. One thought of Chang Tso-lin principally as an administrator and organizer. One never thought of him as careering through the country on an expansionist enterprise, although he has had to fight and to maintain a huge military establishment to prevent other militarists from coming into his provinces to create chaos and to seize the revenues.

It was, therefore, a disappointment to Chang Tso-lin's Chinese friends as well as to many of the foreigners who had made large investments in Manchuria, that everything was being endangered by this venture to unify China by force, this plan to find fat ballwicks for the lesser Mukden leaders. The rebellion against Chang Tso-lin in his own organization, the insistence on the part of his younger generals that the expansionist policy should be dropped, was not surprising. For there is an overwhelming sentiment among the residents of Manchuria, Chinese and foreign alike, that the Three Eastern Provinces should be kept out of China's civil wars.

Japan's Investments

But to Japan, peace in Manchuria means much more than that. Japan's major economic investment in China is in Manchuria. Japan has done more to build up Manchuria than any other single factor. Japan has fought two wars on Manchurian soil, one of them against Russia, designed to protect her economic life, her national vitality from Russian imperialism. The effect of Japan's war against Russia in Manchuria has been to keep Manchuria as part of the Chinese Empire and the Chinese Republic, for with the weakness of the Chinese Government, a power like Russia could easily have taken Manchuria as she took the Amur region, from China. It was fear of Japan that stayed the hand of Russia. It was memory of the beating at Mukden that prevent Imperialist Russia and Soviet Russia from again seeking to utilize Manchuria as a highway to a warm port in the Pacific, at the expense of China.

Japan has invested one and a half billion yen in the economic development of Manchuria, much of which has been so far-sighted that the returns are not yet to be seen. Out of this huge investment, the real beneficiaries have been the Chinese, who own the land which has increased in value, the Chinese merchants and bankers who have handled the business, the Chinese laborers who have found work. As one goes through Dairen, or Mukden or Antung, the outstanding fact is that in spite of the enormous Japanese investment, everything is Chinese-owned and the wealthiest men of the community are Chinese. To Japan, this is important because from Manchuria must come Japan's supply of food and raw materials and Japan is more than anxious that it should come from a friendly people.

It is a noteworthy indication of this fact that there has never been an unfriendliness toward Japan in Manchuria when other parts of China were seething with anti-Japanese propaganda.

The Bolshevik Plague

The danger then to this investment and trade, to Japan's supply of food and raw materials through civil war, banditry and lawlessness in Manchuria is very great. Furthermore, Manchuria borders on Korea and disorders are epidemic like plagues. Without a sound government in Manchuria, those places which border on Korea, Chientao and Hunchun, will become centres of anti-Japanese propaganda, where Korean revolutionists and Bolsheviks will gather on Chinese soil to bring misery upon their own people. Japan cannot ignore the possibilities of such a situation, just as the United States keeps an army in Texas to protect the Mexican border, while the Canadian border has been left unprotected for more than 100 years. Where there is chaos the forces of law and order have to protect themselves against the spreading of the plague. The bringing, then, of the civil war to Manchuria, not only affects Japan economically, but politically. It seriously affects Japan's situation in Korea. It raises questions which have been regarded as settled. It is particularly dangerous at this time to the peace of the world that such questions should be raised when Bolshevik activity in China is becoming one of the principal problems of the day.

Soviet Russia thrives on disorder. In countries like the United States, Great Britain, France, Italy, Japan, Soviet Russia can do nothing. As soon as a nation sets her house in order, as Persia for instance has recently done, the Soviet agent and the Soviet policy goes by the board. In China, Soviet Russia and the Bolshevik theory has made no progress in those parts of the country which are orderly and where the people are prosperous. In Manchuria, close to the Siberian frontier, where the people know the Bolshevik better than in other parts of the country, Soviet Russia has had no influence. Just as the Chinese of Manchuria are friendly to the Japanese, so are they antagonistic to Soviet Russia. That is because they are prosperous and happy and have devoted themselves to trade and commerce and industrial enterprises under a well-administered government.

Now that there is a possibility of disorders and civil wars in Manchuria, the situation may change. The people have come under the heel of contending militarists. They will be illegally taxed. They will be driven to exasperation by the contending soldiers destroying their fields and their crops, quartering themselves in their homes and barns, seizing their horses and cattle, shaming their women. The Manchurian, under such circumstances, will become a prey to the evil doctrines of the Bolshevik just as in Kwangtung he has become subject to the Soviet agent after fourteen years of constant and unending civil war. Men's political ideas are not altogether unaffected by the bread they eat. The Bolshevik agent follows on civil war and disorder as the vultures come down on the dead in the battlefield.

Self-Protection

Japan cannot ignore such a situation. To the United States and Great Britain the possibility and extent of Bolshevik activity in Manchuria may be an interesting academic question. To Japan it involves the very life of the nation. China may not care what the Russians do in this country; but Japan cannot risk a possible destruction of her national integrity, of her civilization through the disintegrative propaganda of Bolshevism. It would be a lesser evil for Japan to fight Russia on the soil of Manchuria than to allow the Soviet agents to do to Manchuria what has already been done to Mongolia.

Facing such a situation, Japan is straining her neutrality to the point where it is begining to hurt. Japan has been scrupulously neutral and non-interfering in the present civil war. Japan has watched her interests and position in Manchuria endangered without raising a finger to protect them, because of a desire to prove to the world and to China that the "Change of Policy" announced after the Washington Conference was a sincere expression of Japan's point of view *vis-a-vis* China. Now Japan is again faced with a critical problem arising out of the imperialistic designs of Chang Tso-lin. The wonderful work of Japan in Manchuria, her huge investment in that country, her vested interests there, may be wiped out through the overweening desire of a Chinese warlord to become master of the whole of China with Manchuria as his base. Furthermore, Japan is in the position of being faced by her arch-enemy Soviet Russia in Manchuria because the disorders to which the Three Eastern Provinces are to be subjected through the civil wars, no Chinese opposition to Russian aggression can avail. **In a word, at a moment when Japan is doing everything that a sovereign, self-respecting nation can do to win the good-will of the Chinese people and to make every possible concession to China, she is faced with the need of protecting her own national life which is closely bound up in the Manchurian situation. On the development of this problem hinges not only the peace of Asia but of the whole Pacific.**

More of Mr. Brisbane's Nonsense

IF Mr. Brisbane, the war-maker, knows as little about the Pacific situation as he does about China, it is more than unfortunate that he is being permitted to influence so large a public opinion in America. The following is taken from one of his daily editorials:

> China you may be interested to hear, is *hanging bandits in Shanghai*. For a while a disorganized government was unable to furnish hangmen and protection for the hangings.
>
> Partial order being restored, *12 Chinese robbers were hanged* before thousands of spectators yesterday, after having been paraded through the streets. *Six will be hanged every day for the next 30 days.*
>
> Chinese take death calmly. When criminals are sentenced to be beheaded, a dozen or more will walk out, kneel down in a row, *and wait for the headman to come along and chop their heads off*, not one trying to escape. They are not nervous.

The italics are ours and they are used to indicate an untruthful statement. No hangings have taken place in Shanghai. Mr. Brisbane may refer to the shooting of some criminals who had had a trial in a court in this city, but there has been no wholesale hanging of bandits. We do not know who gives Mr. Brisbane his information. But however it comes to him, it is inaccurate, careless and wrong. A man in his position cannot afford to be caught red-handed in this way. He ought to be more careful.

The importance of Mr. Brisbane's remarks, however, are not in their inaccuracy nor in the slender information upon which they are based. The importance lies in the fact that almost everything Mr. Brisbane says about the Far East or the Pacific is about the same. It is stuff which rests upon the most slender basis of fact, upon some isolated detail, upon some exaggerated gaucherie. Yet Mr. Brisbane would make war on the Japanese, he would involve the United States in serious international complications, he would stir up world-wide animosities—all for what reason? Simply because he lacks information, because he is unable to get at the facts himself, because he is willing to use his name and his intellect to foist upon his fellow countrymen half truths.

Arthur Brisbane and the Hearst papers have for years been the principal enemies of Japan in the United States. If a war should ever take place between the United States and Japan, Mr. Hearst and Mr. Brisbane will have to be blamed for the years of enmity and bitterness, for the constant propaganda, for the hatred and racial prejudice which they have engendered. If their information is all of a kind with the editorial which we have reproduced, are they not doing an incalculable mischief to their own country, by misinforming their own people? It is impossible to believe that the great Hearst organization cannot get at the truth if it wants the truth. It is impossible to believe that they publish the drivel they do about the Far East without having an ulterior motive. Yet, the Far East can be to them as open a book as it is to those who really seek the truth.

Important Contract for Glasgow—Great Airship Shed for India

We are informed that the Armstrong Construction Company Limited, who are Associated with Sir W. G. Armstrong, Whitworth Co., Ltd., have been entrusted by the Air Ministry with the construction and erection at Karachi of one of the largest Airship Sheds in the world.

The whole of the steelwork for this great structure will be fabricated at the Company's Works at Gerniston, Glasgow.

The Shanghai Bund—Pride of the Foreigners in China—built upon swampy and reclaimed land

The Extraterritoriality Commission

Called to Meet on December 18 while the Guns of Rival Parties are Booming under Peking's Walls

THE Tariff Conference and the Commission for the investigation into the advisability of abolishing extraterritoriality were provided for by Washington Treaties. The Tariff Conference was delayed because France refused to ratify the Washington Treaties as long as the Gold Franc question was unsolved. The commission did not come to China because the Chinese Government requested it to stay away. The May 30 Affair, which evoked such strong nationalistic sentiments throughout China, brought about a condition which made it inevitable that all the provisions of the Washington Treaties should be enforced or the treaties declared useless. The Tariff Conference is now in session, although under difficulties because of the civil war in the country and the actual fighting within the vicinity of Peking. Nevertheless, China has made tremendous gains at that Conference ; greater gains than either at Versailles or Washington and if the treaty, as finally written, does not provide China with a completer sovereignty, a greater equality, it will only be the fault of China's militarists who sacrifice every national purpose, every national consideration to their own private interests.

The Extraterritoriality Commission is to meet in Peking but it is doubtful if the delegates can reach there at the appointed time. The delegates are to consider

That the Governments of the Powers above named shall establish a Commission (to which each of such Governments shall appoint one member) to inquire into the present practice of extraterritorial jurisdiction in China, and into the laws and the judicial system and the methods of judicial administration of China, with a view to reporting to the Governments of the several Powers above named their findings of fact in regard to these matters, and their recommendations as to such means as they may find suitable to improve the existing conditions of the administration of justice in China, and to assist and further the efforts of the Chinese Government to effect such legislation and judicial reforms as would warrant the several Powers in relinquishing, either progressively or otherwise, their respective rights of extraterritoriality ;

That the Commission herein contemplated shall be constituted within three months after the adjournment of the Conference in accordance with detailed arrangements to be hereafter agreed upon by the Governments of the Powers above named, and shall be instructed to submit its report and recommendations within one year after the first meeting of the commission ;

That each of the Powers above named shall be deemed free to accept or to reject all or any portion of the recommendations of the Commission herein contemplated, but that in no case shall any of the said Powers make its acceptance of all or any portion of such recommendations either directly or indirectly dependent on the granting by China of any special concession, favor, benefit, or immunity, whether political or economic.

The Foreigner's Position

The extraordinary position of the foreigner in China has been a subject for the expression of violent emotions on both sides. The foreigner has felt that he has built up a position for himself by his initiative, capital investments and hard work; that the concessions and settlements, the spheres in which he may live, are marshes and swamps, rocks and out-of-the-way places, reconstructed largely if not entirely through his energy and ability, in the course of years into magnificent cities, the equal in many respects of cities in Europe and America. Huge capital investments in industry, trade and land-ownership have been made on the assumption that there would be no radical change in the legal position of the foreigner in China, where he is under the jurisdiction of his own officials, where he lives under his own laws and is judged by judicial officers appointed by his own government. The whole fabric of foreign trade and commerce, of foreign life in China, is interwoven in this system of extraterritoriality. To readjust would entail huge expenditures and work great hardships.

The foreigner, furthermore, fears the Chinese official and his system of taxes and courts. Life in China does not impress one with either the ability or the integrity of Chinese officials and the Ostroumoff Case in Harbin, the Eugene Chen case in Peking and Tientsin and hundreds of similar cases throughout the country do not impress one with the equity or justice of Chinese courts. The imposition of illegal taxes, the habit of militarists of imposing forced loans and the failure of so many officials to differentiate between the public and the private purse, naturally cause many foreigners to fear that in the event of the abolition of extraterritoriality, they, their property, their trade, perhaps even their lives would be placed in jeopardy.

The Missionaries

The missionaries seem to take quite a different attitude. Although many of the missionaries live in the interior and are therefore more subject to any evils in the Chinese governmental system than foreigners living in the cities under the protection of foreign managed police forces, the principal missionary bodies in China, American and British, have gone on record as favoring a speedy readjustment of China's treaty relations so that the treaties may be more equal and the clauses to which the Chinese take objection be taken out. The missionaries have issued statements on this subject and have developed a very strong public opinion, particularly in the United States favorable to the Chinese point of view.

The Chinese View

The Chinese themselves, almost without exception, regard the treaties as antequated and as objectionable to an independent and sovereign nation. They object to extraterritoriality, to the concessions and settlements. They object to the extraordinary privileges of the foreigners and to the conditions which exist in the foreign concessions. They object to the extension of extraterritorial privileges to Chinese living in foreign concessions. The Chinese want the whole system scrapped. Where, however, some Chinese differ from others, is that the radicals would do away with these conditions by the stroke of a pen, while the more conservative men are seeking for a constructive program, for a formula which will insure economic stability during an interim period of readjustment.

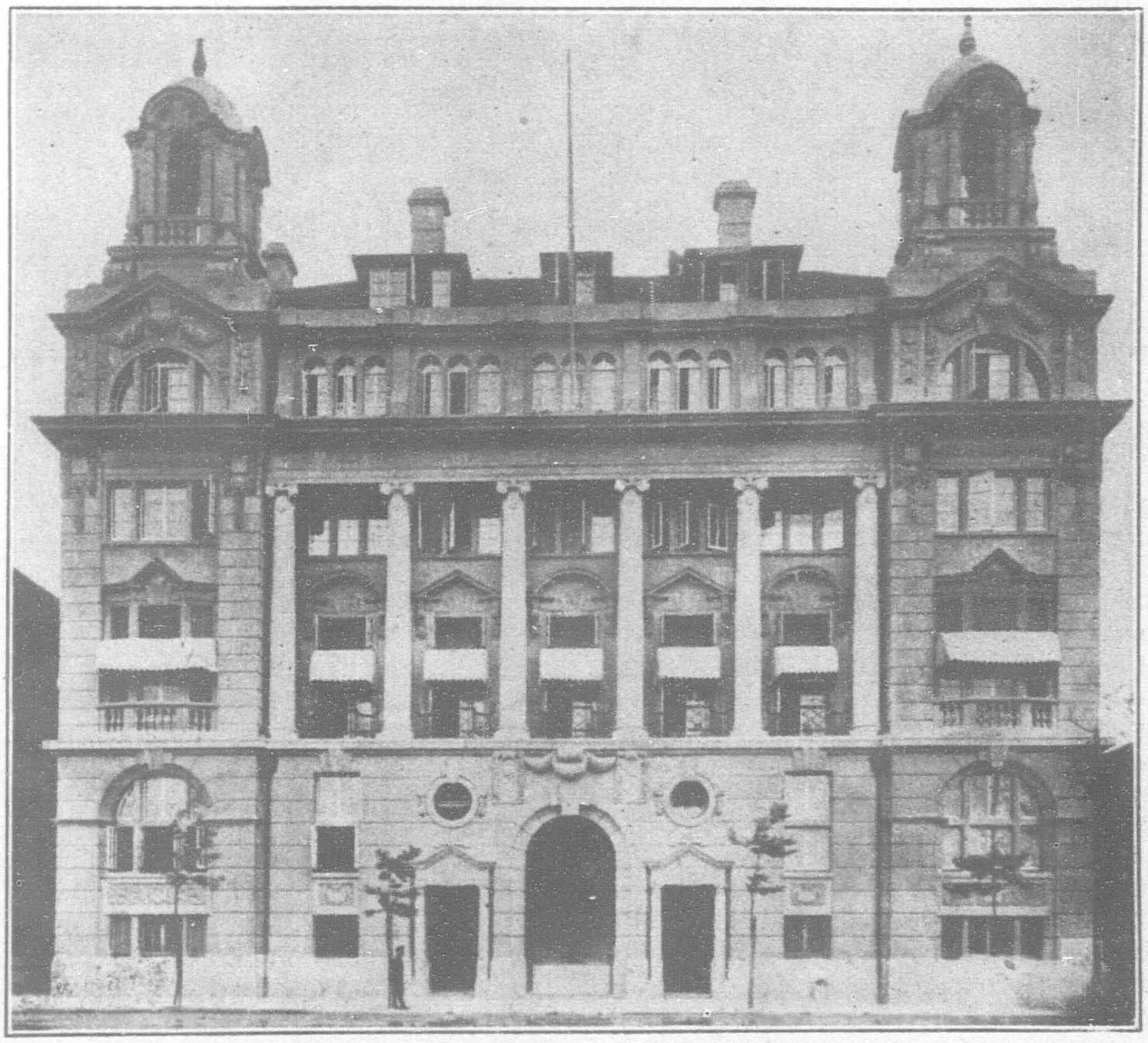
With this view liberal foreigners to a very large extent agree. It is becoming more and more difficult for foreigners in China to maintain the stand that the treaties which were first written eighty-three years ago are unchangeable under any circumstances. It is becoming more difficult to make men believe that conditions in China are worse than in many of the Balkan states or in some parts of Europe which have suffered from the war. The situation in China is bad enough, but the confusions involved in the utilization of a system extraterritoriality makes it even worse. The Chinese, like the Japanese, take umbrage at being regarded as an inferior race, when as a matter of fact, they have a large and populous country, most of which is productive and progressive in spite of political disorders. They point to the increase in trade, in industry, in the development of education, in spite of the civil war and the attendant disorders. They claim that their courts are satisfactory to them in the respect that they are constantly improving in legal methods and in integrity and that if the Chinese are willing to live under those courts, the foreigner who comes to China, whether to make money or preach religion ought to live under those courts, just as the Chinese who goes to a foreign country might have to come before a court in which there is an inherent prejudice against the yellow man. In a word, if the trade is worth anything at all, it is worth the submission to Chinese law. The Chinese want the concessions abolished because they form enclaves, economic and political, endangering the political integrity of China as well as providing a cause for anti-foreign disturbances as nationalism among the people develops. In a word, whether the system is to be changed slowly or rapidly, the Chinese and many foreigners living in China, feel that it must be changed. And they believe that if it is changed with the co-operation of the foreign powers, there will be less bitterness, less jealousy, fewer pin-pricks afterwards, but if the foreigners adopt a die-hard attitude, a national anti-foreign cataclysm is bound to ensue which will bring misery to China and will defeat the purposes of the foreign powers.

The Yokohama Specie Bank Building on the Bund, Shanghai—an office building of quality

The Kailan Mining Administration Building in Tientsin, a monumental structure

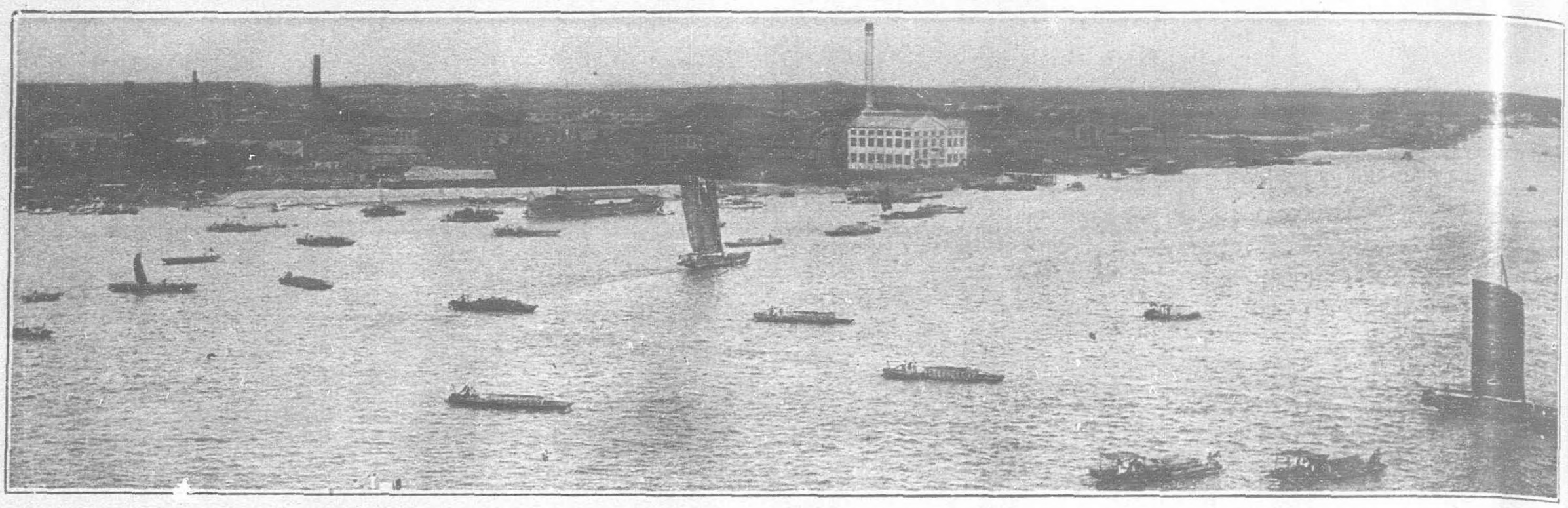
What the Foreigner Wants

In any consideration of a problem of this character, it is necessary to be broad-minded and to recognize the fact that trade and commerce thrives better in an atmosphere of friendship than in the constant wrangling and hatred which arises from one people regarding itself as oppressed and other nations as the oppressors. It is true that the foreigner has built up a huge vested interest in China, that he had a huge land investment in the concessions and that his business enterprises involve millions of dollars. It is also true that these investments are just as much in danger of financial losses rising out of nationalistic, anti-foreign movements as from the incapacity of the Chinese government to provide an adequate system of government. What the foreigner wants in China, is not a continuation of the present system indefinitely as much as protection of life and property so that he might be able to do business here as elsewhere, so that he might be able to obtain a reasonable profit on his investments in the country. He would like to see a good government established that there might be an increase in business, in the development of natural resources, in the opening of mines, the building of railroads, etc. He wants an end to this constant straining of political questions at a time when what is necessary is not politics but reconstruction, not talk but action.



The Shanghai Club—the center of the social life of the foreigners of China

If a formula can be worked out which would give the foreigner the protection he seeks to life and property and return to China full sovereignty, conditions in China would improve. The task of offering the protection is up to China. That is one of the duties of a sovereign power. The day China can end banditry, can put a stop to disturbances of trade, can provide free movement on the highways and can afford the ordinary protections under its police power usual in a sovereign state, there will be no excuse, no justification for a continuation of the present system. The only

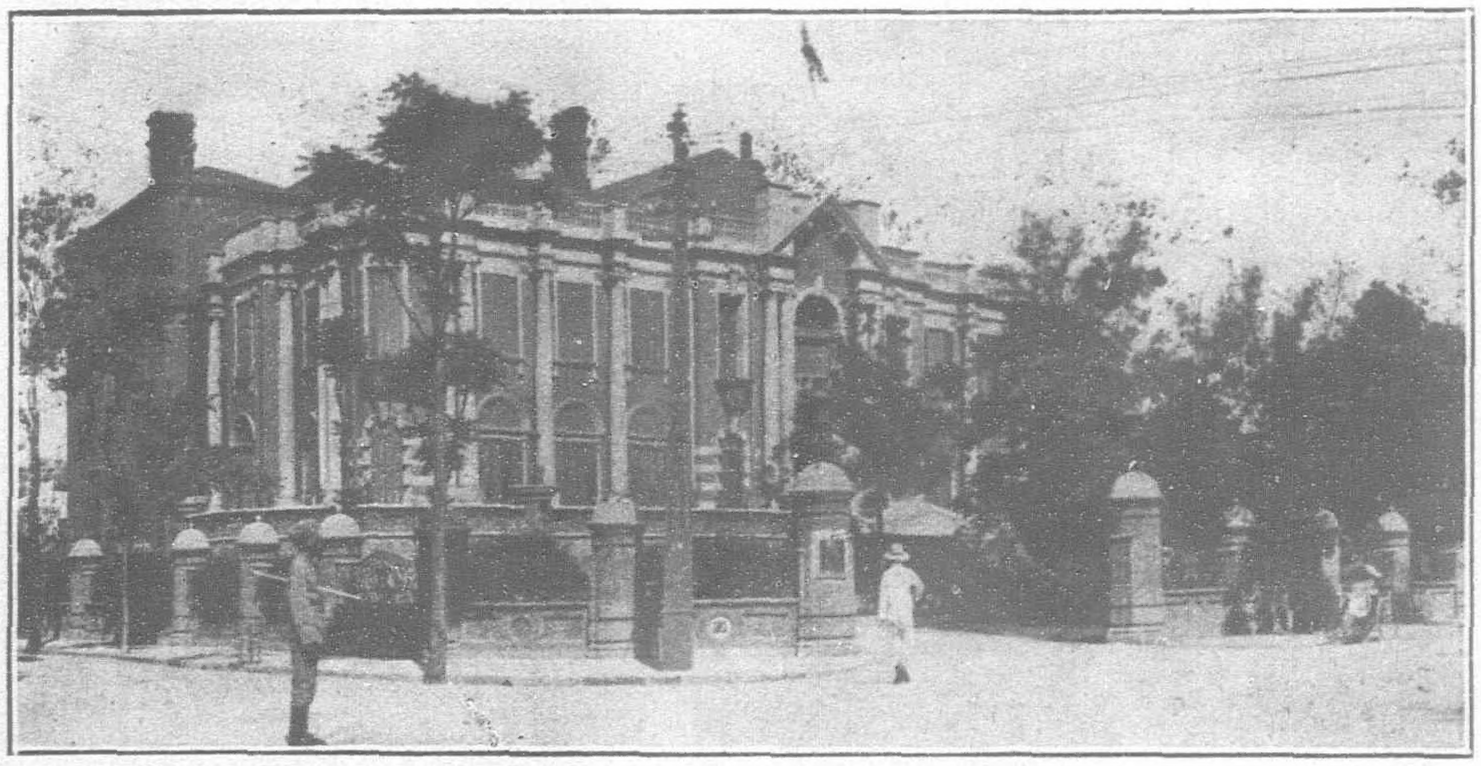


The Japan-China Spinning and Weaving Company at Pootung, opposite Shanghai, in Chinese territory

justification at the present time is the disorder in the country. The only claim that foreigners have to their own governments affording them protection is that there is no one else to protect them, that the Chinese government is unable to control the militarists who have usurped the functions of government and who when defeated turn into highwaymen who levy upon the population in the vicinity of their camps. It is this alone which is responsible for any desire that the present unequal treaties should continue.

The passing of laws, the enactment of codes, the drawing up of plans for the reorganization of courts are insufficient for guaranteeing law and order in a nation. China must have more than that. There must be the will to obey the law. There must be a sense of law. In the past, China has been governed by whim, whether that whim be imperial or republican, whether the expression be an imperial decree or a presidential mandate. Several constitutions have been drafted but none of them have effectively become the law of the land. A criminal and civil code has been worked out but they have not become applicable in wide areas. In a word, China is still without a modern governmental machinery after fourteen years of effort in that direction. It is not that there are no competent men in China. It is not that China could not work out a governmental system. The reason for this is that progress in China is impeded by the militarists, by their civil wars and their selfishness. The day these men submit to a civilian organization, conditions would so improve that the foreigner could easily afford to risk his life and property to the mercies of the Chinese government.

For civilian government is more or less the same the world over. There are weak governments and strong governments and they follow each other in periods of prosperity and depression. If a government is legally constituted, orderly conducted, its strength or weakness does not matter so much. In China, it is not a question of a weak government or a strong government, as that just now there is no government at all. There is simply a central clearing house in Peking which keeps the powers from withdrawing recognition while everybody does as he pleases throughout the country. Therein lies China's weakness.



The Tientsin Club—Another British Institution in China

The Japanese are Our Good Customers Now, Too

THE changing attitude of Americans toward Japan, the result of a better understanding of our trade relations, is perhaps not more succinctly stated than in an editorial in the *Davenport, Iowa, Democrat*. Coming from a middle western community, the statement is all the more valuable, as the Middle West in the United States is usually impervious to friendships abroad. The inherent meaning of the 100 per cent. Americanism, so often too glibly used as anti-foreignism in American communities, is not to despise those who happen not to live on the American continent, but rather to meet in fairness and bigness of heart the nations of other continents which are struggling for a place in the sun.

The editorial follows :

> It is not so long ago, is it, that our idea of the Japanese was of a lot of little people working long hours in factories and underselling us on matches and tooth-brushes and lots of other things. Their imitative qualities, their willingness to work and their low standards of living promised, some feared, to drive a lot of our own manufactures even out of our home markets.
>
> To-day we hear little of that, while we find reports of American exports showing that the Japanese are buying our own manufactures in quantities seven times as great as before the war, and probably growing larger every year. The change includes some interesting features, to be observed in statistics coming from the trade record of the National City Bank of New York.
>
> Japan has no steel, so it is not surprising to find that in 1923 she bought of us steel sheets worth 8 million dollars, iron and steel bars about 2 millions, tin plate 4½ millions, and rails for railways 3 millions.
>
> She likes our autos, too, and bought passenger cars 2 millions, motor trucks 3 millions, auto tires and casings 1 million. Needing gas to run the cars, she bought petroleum products, gasoline, lubricating and illuminating oil, 10 millions.
>
> Motion picture films account for another million, and the newer levels of life in Japan are reflected by millions spent with us for electrical heating and cooking devices, gas stoves, ranges and water heaters, internal combustion engines, telephone and switchboard apparatus, adding and calculating machines, phonographs, player pianos, radio apparatus and electrically operated household devices.
>
> Ordinarily a report of manufactures and exports is rather dry reading, but against a background of the old Japan and of our supposed disturbed relations with the island empire, these details from our commercial relations are full of interest.

Japanese Finance and Trade

By T. Aoki, Manager, London Agency of the Bank of Japan

THE finances of Japan have expanded considerably during the past ten years, owing to various Government undertakings, which were necessary in accordance with economic development, as well as with increased administration expenses induced by the higher price level. The Budget for the current year amounts to the huge sum of Y.1,615,000,000 this being an increase of over 149 per cent, when compared with the expenditure for 1914, which was Y.648,000,000. The inevitable result was that the Government has had to keep a balance between revenue and expenditure by raising big sums in loans every year, and the public debt, which at the end of 1916 was Y.3,050,000,000 increased to over Y.4,742,000,000 at the end of 1924, an advance of 55 per cent. In addition, the Government issued annually renewal loans amounting to several hundred millions of yen. This caused a tightening up in the money market, and general economic conditions hardly warranted the further expansion in expenditure. The limitation of naval forces agreed upon at the Washington Conference relieved the burden to some extent. Further, the successive Governments made strenuous efforts to readjust finances and to reduce expenditure with a view to correcting any defects in past financial undertakings, and so relax the tension of the Money Market. With this object in view, the Government, in compiling the Budget for the current year, curtailed the sum for expenditure considerably, thus showing a reduction of Y.91,000,000 when compared with the previous year. The public loans to be raised during 1925 will also be minimised. By adopting these measures the financial standing of Japan can be said to have been placed on a strong foundation.

Monetary Conditions

The monetary position of Japan has undergone a fundamental change side by side with the growth of national wealth. Its foundation was made stronger and the scale larger by the establishment of the credit system and the expansion of currency. The development of note issues by the Bank of Japan, as shown by the following table, may prove this :—

NOTE ISSUE OF THE BANK OF JAPAN.

(At the end of each year.)

	Million Yen.		Million Yen.
1914	385	1920	1,439
1915	430	1921	1,546
1916	601	1922	1,558
1917	831	1923	1,703
1918	1,144	1924	1,662
1919	1,555		

The general undertone of the money market has continued firm, from the post-war boom until its reaction period. Therefore, the discount rate of the Bank of Japan, which is the standard of the market rate, has been fixed as high as about 8 per cent. per annum since 1919. But in view of the recent monetary easiness, in consequence of the readjustment of business conditions, and in order to promote the recovery from the damage of the earthquake, the Bank of Japan has reduced its discount rate to 7.3 per cent. per annum. The possibility of a further reduction in the near future is regarded as not unlikely in certain quarters. The banking business in Japan has hitherto been in the hands of too many banks in all parts of the country. This, naturally, prevented the smooth financing of trade, and caused useless banking competition, often not only endangering their own management, but even hazarding the public interest. This being so, financial authorities have recommended the amlgamation of certain banks with quite satisfactory results. As the number of banks continues to decrease the basis is strengthened through the growth of capital, as will be seen from the table below :—

BANKS IN JAPAN.

(In Millions of Yen.)

	Number.	Paid-up capital.	Deposits.	Advances.
1914	2,155	645	2,312	2,870
1915	2,151	651	2,796	3,079
1916	2,143	677	3,816	3,958
1917	2,114	775	5,703	5,322
1918	2,091	899	8,025	6,976
1919	2,052	1,205	9,694	9,153
1920	2,039	1,627	9,681	9,348
1921	2,015	1,736	10,265	10,022
1922	1,980	1,868	10,093	10,434
1923	1,935	1,894	10,516	11,355

Foreign Trade

The tendency of the overseas trade showed a promising aspect after the period of post war reaction, and the total volume of trade became larger year after year, while exports increased and the excess of imports over exports was reduced. But the severe distress of the earthquake brought in its train a large importation of goods required for reconstruction, and caused unprecedented adverse conditions, and a consequent decline in the exchange rate. This, however, may be regarded as a temporary phenomenon, entirely due to extraordinary circumstances, for signs are already observable of a slight recovery in the foreign trade for the first half of this year as compared with the corresponding period of last year. The subjoined table shows the recent progress made :—

	(In Millions of Yen.) Exports.	Imports.	Total.	Excess of Exports of Imports.
1921	1,252	1,614	2,866	*361
1922	1,637	1,890	3,527	*252
1923	1,447	1,982	3,429	*534
1924	1,807	2,453	4,260	*646
First half of 1925	1,081	1,487	2,568	*406

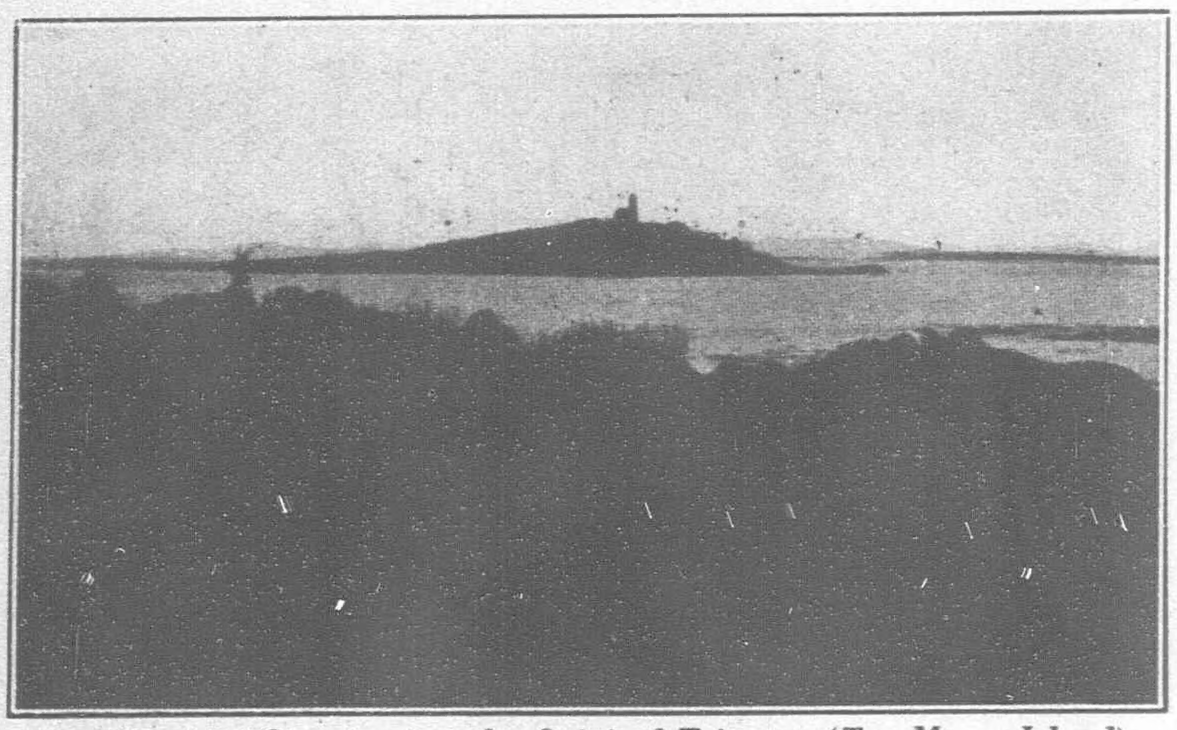
*Excess of Imports.

The prices of commodities which soared rapidly since the war have shown a declining tendency recently, in accordance with the similar trend in Great Britain and the United States of America. This fall in prices should give full advantage to Japanese goods in the world's markets, and also prove a check to imports, and reduce the cost of living and wages. The index mumbers of wholesale prices in Tokio are as follows :—

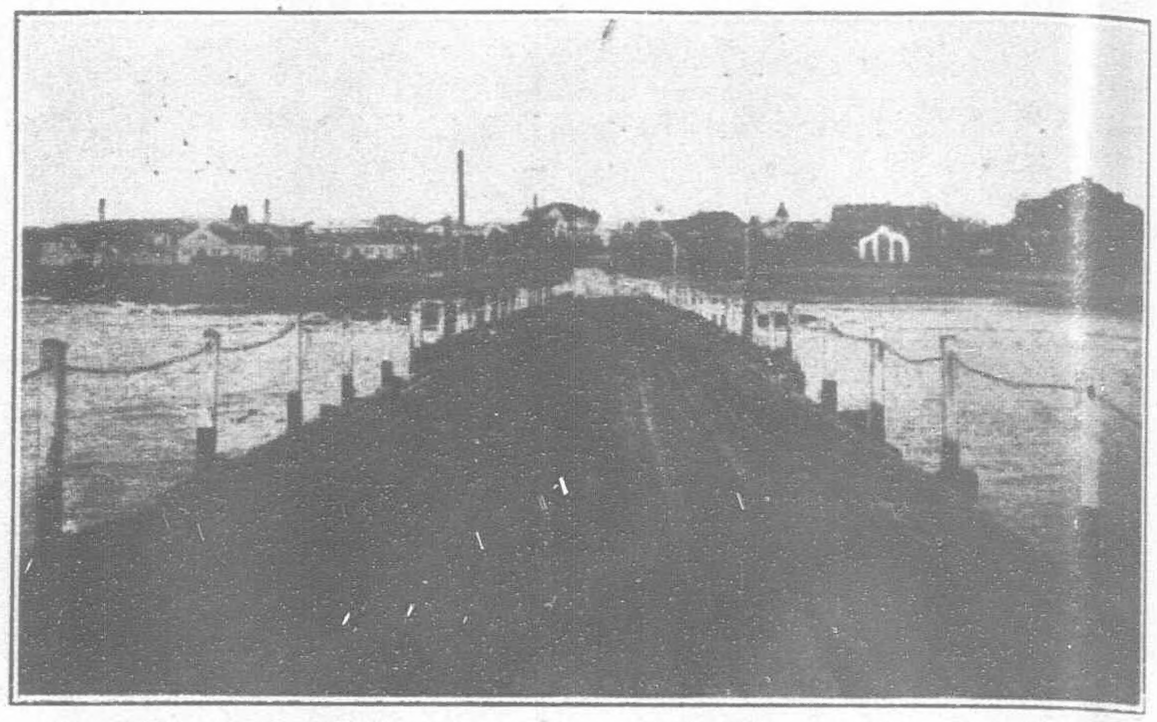
1914 (July ...	... 100	1924 (Average)	... 217
1920 (Average)	... 272	,, (May)...	... 215
1923 ,,	... 209	1925 ,, ...	... 209

Aftermath of the Earthquake

Economic readjustment and restoration have been carried on steadily since the post-war reaction of 1920, and by 1923 most of the unsound businesses which had been established after the war disappeared, while those of strong standing alone survived. Unfortunately at this stage the unprecedented catastrophe of the great earthquake in September caused a setback. Since the stricken area was limited to a comparatively small part of the country, and did not belong to the industrial centre, the producing power of the principal industries was not greatly affected. The confusion and unrest caused by the shock, however, soon quietened down when proper emergency measures were adopted by the Government, the Bank of Japan and other financial authorities. Many thousands of millions of yen were needed for the purpose of restoring the devastated area, and to meet the situation the Government raised a loan amounting to Y.550,000,000 in the London and New York markets. From that time onwards the work of restoration and reconstruction has been carried on successfully and in accordance with the scheme laid out.



Bay South of City showing the Original Tsingtao (*Tao Means Island*) with Light House



Steel Pier in South Bay, formerly used by Germans for their Naval Department Entirely. Looking straight up Shantung Road, Lu Ta Mining Co. Office on Right

The Port of Tsingtao: its Harbor and Wharf Administration and Trade

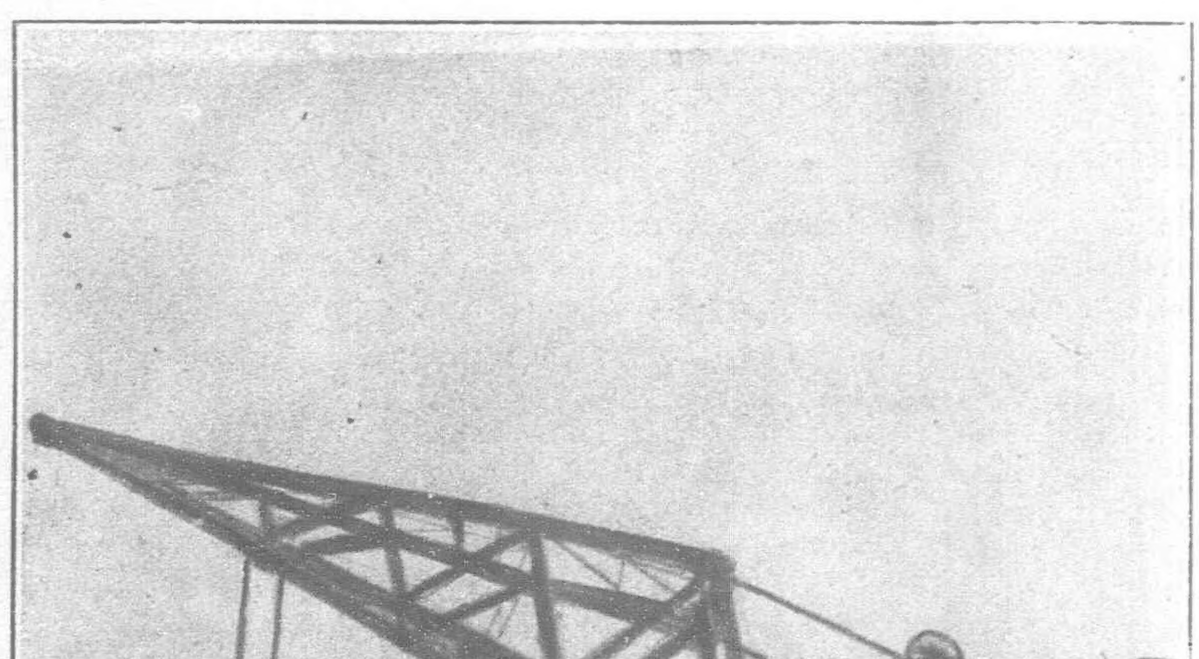
Jick G. Wong, M.A.C. and A.E.

THE Port of Tsingtao occupies an unique position as it is the natural gateway of the Province of Shantung. It is the terminus of the Kiaochow-Tsinan Railway which runs through the heart of the Province, passing through rich agricultural districts and having branch lines reaching into the coal fields. The Railway connects with steamers, thus direct transportation by land and sea is facilitated. Tsingtao, although not so well known as Shanghai as a port, is nevertheless one of the best commercial ports China possesses, being situated on the peninsula which projects into the deep and wide Kiaochow Bay, sheltered on its northeast by the Laoshan Range and surrounded on the south, east and west by water. Being so situated its suitability for a harbor is unequalled. The climate is favourable all the year around and the temperature through the different seasons is averaged at about 55 degrees Fahrenheit. Its healthy atmosphere and scenic views are not to be found elsewhere along the coast of China.

The Harbor Construction

Germany had long sought to have a centre for her trade in the Far East so when she managed to secure the lease of the Kiaochow Territory from China in 1898 serious consideration was given for the development of Tsingtao in view of the natural facilities by land and easy access by water which this port possesses. Previous to the despatch of the German Squadron to the East (1897) the famous Harbor Engineer Georg Franzius, Builder of the Bremen Harbor was sent to Tsingtao to study in detail the water course, depth of water, tidal current, wind direction, topographical and geological aspects. Franzius's plan forthe construction of the harbor was adopted by the German Government. According to the plan advantage was taken of the places where reefs and islets were found for the construction of the long break-water which was accomplished at comparatively small expense in spite of the magnitude of the work. This break-water not only protects the harbor from the strong northwest wind which is a regular visitor of the Kiaochow Bay, but also prevents the mud silt from coming into the harbor, which heretofore flowed from the mouth of the Yellow River during the southeast monsoon season and occasioned many afflictions to Kiaochow. At the wharves and along the bund are warehouses, railway tracks, cranes and all necessary equipments for he future development of trade, all these evince the efficiency of and great pains taken by those who studied and planned such momentous work in those days.

As a result of the careful working out of the plan of the above mentioned break-water the current which was heretofore swift at the entrance of the harbor has been made to flow gently. The harbor entrance and the position of the wharves have been so arranged and at such angles as to make the handling of ships easy. Up to the present no accident has occurred. Although this may



150 Ton Electric Crane on Wharf No. 4

Plan of Tsingtao Showing Area of Reclamation Project for the Proposed Coaling Piers and Freight Terminal

(It is proposed to reclaim areas "A" "B" and "C" by 1930 in order to provide facilities for the exportation of 1,200,000 coal)

be due to the alert handling by ships' officers, still a great deal of credit must be attributed to the skill and attention of the engineer who planned for the construction of the harbor.

The harbor together with the wharves were completed in 1906 at a cost of 30,000,000 marks. The following figures gives some idea of the size of the harbor :—

(*a*) *Break-water ;*	Great Harbor,	2,990 meters × 20 meters.
	Small Harbor,	586 ,, in length.
(*b*) *Entrance ;*	Great Harbor,	269 ,, wide.
	Small Harbor,	100 ,, ,,
(*c*) *Water Area ;*	Great Harbor,	1,550.00 square paces. (or 1.16 sq. mile)
	Small Harbor,	136,000 square paces. (one pace = 5 Chinese feet)
(*d*) *Depth of Basin ;*	Great Harbor,	mean 31 feet.
	Small Harbor,	,, 19 ,, (in vicinity of floating pier)

The Small Harbor is used mainly for Chinese junks, small steamers and launches. The Great Harbor is deep enough for ships drawing eight meters at the neap-tide. The mean difference between high and low water is 12 feet.

Having foreseen the importance of Tsingtao as a trade centre and the Kiaochow Bay as a strategic naval base for her Far Eastern Squadron, the German Government spared no pains in fortifying the port and in developing the harbor and wharves.

Wharves No. 1 and No. 2 could accommodate 12 steamers of 6,000 tons each at one time, while on these two wharves are built seven warehouses with a capacity of 60,000 tons of cargoes. There was originally a floating dry dock of 16,000 tons capacity but was later taken to Japan after the Japanese got control of the port. The berthing quay line of the various wharves and piers are as follows :—

1st Wharf, 766 meters.
2nd Wharf, 1,111 meters.
3rd Wharf, 186 meters. (for inflammable cargoes)
4th Wharf, 1,175 maters. (for salt, coal and ores)
Wooden pier, 123 (for launches)
Small Harbor, 2,455 meters. (for junks)
Floating Pier, Small Harbor, 75 meters (for minor steamers)

The Wharf wall has a section of four meters wide from top to bottom with perpendicular faces, and at each spacing of ten meters along the wall are placed fenders while iron mooring posts and extrafloating fenders are placed every forty meters. The mooring posts, being built of strong material, have been regarded as superior in quality to all others found elsewhere in China.

The godowns along the harbor and the warehouses on the wharves are built of brick with galvanized iron plates for roofing. They are all properly designed with plenty of light and ventilation.

On Wharf No. 4 there is a stationary electric crane of 150 tons capacity for the loading and unloading of bulky and heavy cargo of over 30 tons. Besides thisc rane there are two floating cranes, one of 30 tons capacity and one of 22 tons capacity. There is also one car crane of 4 tons capacity.

The water supply equipment consists of 24 hydrants for the four wharves, each hydrant has a capacity of about 15 kilolitres per hour. On wharves No. 1 and No. 2 there is a total of 12 telephones so arranged as to be easily connected with ship telephones. For goods stored in open spaces the Wharf Office has 344 pieces of canvas for protection against rain.

Three steam launches are provided for mooring and towing purposes, the largest being of 134 tons while the smallest 64 tons. For general purposes four other small launches are maintained, the largest being 16 tons and the smallest 5 tons. One lighter made of steel of 200 tons capacity is used for carrying bunker coal.

Storing ground is as follows :—

(*a*) Coal storing ground, capacity about 63,000 tons.
(*b*) Salt storing ground,
At Great Harbor, capacity about 4,000 tons.
At Small Harbor, capacity about 15,000 tons.
(*c*) Ore storing ground, capacity about 30,000 tons.

Storing ground is as follows :

(*d*) Ground for lease at Great Harbor, about 55,000 square paces.
(*e*) Ground for lease at Small Harbor, about 18,000 square paces.
(*f*) Storing ground on Wharf No. 1, 1,466 square paces.
(*g*) ,, ,, No. 2, 8,338 ,, ,,
(*h*) ,, ,, No. 3, 1,049 ,, ,,
(*i*) Temporary storing ground at Small Harbor, about 10,125 square paces.

The seven warehouses on Wharves No. 1 and No. 2 have a total area of 9,157 square paces, while there are 20 warehouses and godowns along the water front having a total area of 7,618 square paces. (one pace=5 Chinese feet).

Equipment for the moving of goods consists of 15 miles of railway sidings, 3 miles of light railway, 110 cars, 119 large carts, 8 heavy carts and 390 minor carts. The railway tracks run on all four wharves so that loading and unloading of cargoes can be made direct from steamers to cars or *vice vresa*.

The number of wharf coolies for the general moving of cargoes average from 1,000 to 3,000 men, each capable of working about 3 to 4 tons per day of ten hours. The Tsingtao Wharf Corporation Stevedores, and T. Adams & Co. provide the coolies. The Stevedores get their money from the Harbor and Wharf Administration which collects from the shipping companies for tonnage of cargoes moved. There are sufficient coolie quarters provided by the various Stevedores to accommodate about 1,500 men.

Besides the above mentioned equipments and facilities for the handling of cargoes there are numerous light-houses, buoys, fog-sirens, beacons, whistling buoys, etc. for the safety of navigation within the harbor.

The Administration of the Harbor and Wharves

The administration of the harbor and wharf affairs has gone through various steps before arriving at the present system. The following were the various changes made due to the changes in control of the port.

At the beginning the Wharf Office personel consisted of only four Germans. Then the business was simple, as it did no other direct wharf business except examining the account books of the companies which paid wharf dues and assigning berthing space to the various steamship companies. The Harbor and Wharf Administration is now organized as follows :

DIRECTOR

ASSOCIATE DIRECTOR OR HARBOR MASTER

Department of General Affairs :
Archivés and Documents Division.
Miscellaneous Work Division.
Repairs for workshops. Stores for supplies.
Accounting Division.
Statistical and Auditing Division.
Inspecting Division.
Branch Office at Small Harbor.

Department of Wharf Affairs :
Stevedore Division.
The third Wharf. The fourth Wharf. Tool Stores.
Shipping and Landing Cargo Division.
Warehouse Division.
Custody Warehouse.
The First Wharf.
A-Warehouse. B-Warehouse.
C-Warehouse. D-Warehouse.
The Second Wharf.
F-Warehouse. G-Warehouse. H-Warehouse.

Department of Harbor Affairs :
Marine Division.
Tsingtao Flag Station and Great Harbor Flag Station.
Steam Launches,—The Saturn, The Uranus,
The Pole Star, Sa Shu Chuan.
Signal and Equiping Division.
Tcha-lien-tao Light House.
Tai-kung-tao Light House.
Yu-nie-shan Light House.
Horse-shoe Reef Watch-house.
Ship Mooring Division.
Tugboats,—The Venus, The Jupiter,
The Mercury, The Neptune.

Department of Engineering Affairs :
Civil Engineering Division.
Cement Brick Factory.
Mechanical Engineering Division.
Engineers' Office Steam Launches.

Revenues and Expenditure of the Harbor and Wharf Administration

The charges collected by the Harbor and Wharf Administration are : for towing, working cargoes on board and on wharf, stevedore charges, wharfage fee, storage, warehousing, ship repairs, etc. The total revenue collected for 1923 amounted to $1,047,326 while the expenditure for the same year was about as follows :

To salary of staff	$ 295,672
,, material for light-houses	3,000
,, coal	34,000
,, repairing quays	960
,, machineries	1,200
,, office equipment	8,000
,, other materials	4,800
,, miscellaneous	32,368
,, working cargoes, stevedore	315,000
Total amount paid out	$ 695,000
Surplus for 1923	352,326
Total	$1,047,326

The returns for 1924 shows that the revenue has increased by about 20 per cent. to $1,203,718. At present the Administration has plans for the extension of Wharf No. 1 and the construction of a dock yard but as these two works would cost several million dollars nothing definite can be done as the annual surplus has been allocated for the up-keep of the Directorate-General and for meeting deficits occurring in other Departments of the Port Administration.

Relation Between Wharf and Railway

As stated in a previous paragraph the Wharf Office was under the Railway management during the Japanese occupation, but now it is a separate organization so frequently the Railway encounter great difficulties in the transferance of freight. Accordingly with the idea of doing away with the present inconveniences the Railway Authorities have negotiated many times with the Wharf Administration but so far nothing definite has been accomplished toward the solving of the problem. The best plan would be for the Railway to take over the management of the wharves. The Railway could pay the Port Administration a lump sum at fixed periods. Obviously such an arrangement would effect great saving in the administrative expense which would be used for the future extensions and improvements necessary to meet the expected increase in the volume of trade. Having control of the wharves the Railway could then make definite plans for the development of the wharf facilities which would bring great benefits to both the Railway and the merchants in the increased speed in moving cargoes. As the volume of traffic carried by any Railway is more or less governed by the capacity of the terminal facilities the Railway must try every means to get control of the wharves, or to have the power in deciding and carrying out all improvements and extensions necessary for the handling of the future increase in trade which is bound to come.

A Plan for the Extension of the Terminal Facilities

" The volume of traffic which a line would carry cannot exceed the capacity of the terminal " is more true to our Line than to any other as the amount of goods exported from this port is very great, especially with regard to the exportation of coal. Mr. T. Ohmra, Traffic Manager of the Kiaochow-Tsinan Railway, a prominent Japanese Engineer and former Adviser to the Ministry of Communications, estimates that by 1930 the coal production along the Kiaochow-Tsinan Railway will reach 2,460,000 tons of which about

one-half of this amount would be for export. The Tzuchuan Colliery is expected to produce over 1,400,000 tons while the Poshan, Takunlun and other mines to produce about another 1,000,000 tons annually. In order to handle this amount of coal for export it is of the utmost importance to provide a storage yard sufficient in size to store at least the amount of coal for one month so as to meet fluctuation of the water and rail transportation. The area of such a storage yard must be at least 200 *mows*. (one *mow*=6,000 Chinese square feet).

Besides the storage yard, means must be provided for the transhipment of coal from the coal piles to the steamers. Accordingly it is proposed to reclaim the portion "A," "B," and "C," making an opening through the break-water of 600 feet wide and using lighters to approach the coal piles. The areas "A," "B," and "C" to be protected by a masonry bulk-head which would give sufficient berthing space for more than 20 lighters of say 80 tons each in capacity at one time. It will then be possible to load 5,000 tons of coal in one day to five steamers anchored in the harbor. It is estimated that about 1,000 tons per day by means of lighters can be handled. This would meet the requirement of exporting 1,200,000 tons per year. The cost of reclamation of "A," "B" and "C" with bulk-head, tracks, bridges, etc. is estimated as follows :—

Reclamation with bulk-head	$1,176,000
Tracks, 10 km. using old 60-lb. rails	100,000
Bridges and buildings	250,000
Signals and safety appliances	35,000
Total ...	$1,561,000

The bridge across the cut in the break-water would be only a temporary structure until the whole reclamation scheme is completed, then the bridge would not be required. For rental of the coal storage yards resulting from the reclamation of "A," "B" and "C," it is estimated to bring in a revenue of about $100,000 besides which there would be the usual charges for berthing space, loading, etc.

The Germans certainly had great foresight in building the Kiaochow-Tsinan Railway for if one will study the map of China it is at once apparent what immense possibilities there are for the future of this Line with its vast hinderland and sea-port terminal. Had it not been for the Great War the Germans no doubt would have long extended this Line westward into the coal fields of Honan and Shansi Provinces. The Peking Syndicate owning the coal mines in Honan and operating the Tao-Ching Railway had long sought to connect the eastern terminus of the Tao-Ching Railway with Tsinan thereby giving them the shortest route to sea. From Tsinan to connect with the Tao-Ching Railway is only a stretch of about 200 miles through a practically flat country. The cost of this connecting line should not exceed $20,000,000 Mex. When this connection is made the Tsingtao terminal must be enlarged to meet the conditions required for the exportation of coal. Accordingly it is proposed to reclaim the portion of the Kiaochow Bay north of the break-water and build the four coaling wharves as shown in plan. The completion of such a scheme would give sufficient facilities for the handling of the coal coming over the Kiaochow-Tsinan Railway when the Railway is fully developed.

The principal products of Shantung are those from mines and farms, consequently the amount of trade in this Port varies with the season. The busiest time of the year for exports begins with November and ends at the beginning of June of the following year. During this period the harbor activities present a very lively scene. The principal exports are coal, cokes, salt, groundnuts, groundnut oil, iron ore, ore, eggs, tobacco leaf, soft-wood, etc. In 1922, 382,858 tons of coal were brought to the wharves by the Railway. Other items were, 22,817 tons coke, 40,320 tons iron ore, 15,490 tons groundnuts, 1,978 tons of tobacco leaves, 1,064 tons of dyestuff, and 4,334 tons of wheat bran. At Erh-Shih-Li-Pu, a station on the Kiaochow-Tsinan Railway and 178 kilometers from Tsingtao, the British-American Tobacco Company has a large plant for the collecting and curing of tobacco leaves. The tobacco company gives every help to the farmers in the cultivation of tobacco which is very suitable for the soil of the district mid-way between Tsingtao and Tsinan. In view of the greater value of the tobacco crops over the ordinary farming products it is likely that more and more tobacco will be cultivated in this region. The principal imports are raw cotton, cotton cloth, cement, cotton yarn, iron, machinery, wood and planks, match material, kerosene, mats, etc. Of the imports the principal items carried by the Railway were as follows for 1922 :—iron plates and iron ware 16,904 tons, kaoliang 85,072 tons, woods 27,216 tons, cement 7,896 tons, raw cotton 7,544 tons, coal pitch 7,151 tons, kerosene 5,817 tons, cereals 5,054 tons, match material 4,079 tons, cigarettes 3,383 tons, brooms 3,253 tons, and cotton yarn 1,696 tons. The large importation of kaoliang was an unusual thing for this harbor but brought about by the breaking down of the transportation system of the Peking-Mukden Railway caused by the Chihli-Mukden War in 1922.

The Kiao-Au Administration

The former German Leased Territory of Kiaochow which passed to the control of Japan during the Great War was returned to China as a result of the Washington Conference. After taking back the Kiaochow Territory from Japan the Chinese Government established the present Kiao-Au Administration with a Director-General at its head for the administration of the affairs within this territory. All public utilities such as water works, harbor and wharf facilities, electric works, telephone system, etc. having been built by the German Government and later extended by the Japanese became the properties of the present Administration. Consequently the management of these public utilities form several Departments of the Kiao-Au Directorate-General. In the Treaty between China and Japan for the retrocession of the Kiao-Au Territory it was stipulated that 20 per cent. of the Customs receipts shall be allocated to the Directorate-General for the maintenance and improvements of the Port of Tsingtao. The Customs remaining under control of the Central Government with its foreign Inspector-General on account of the foreign loan obligations. For 1923 the Customs' contribution amounted to over $400,000.

The following figures show the Budget of the Kiao-Au Administration for the year 1924. At the present writing the actual figures could not be obtained, only the figure for the total receipts of the Harbor and Wharf Office available being the amount of $1,203,718 for 1924.

1924 Budget of the Kiao-Au Administration

Revenue :			
Harbor and Wharf Office			$1,000,000
Water Works Office			288,000
Telephone Office			250,000
Agricultural and Forestry Bureau			24,000
Contribution from Customs (20 per cent.) ...			460,000
Finance Dept. (taxes)			
Land rentals	$400,000		
Ground tax	100,000		
House rentals	100,000		
Business tax	20,000		
Vehicle tax	26,000		
Miscellaneous tax	15,000		
Sanitation fee	84,000		
Miscellaneous receipts ...	24,000		
		779,000	
Total estimated receipts			$2,801,000
Expenditure :			
Directorate-General			$ 240,000
Police Dept. (including water police)			530,000
,, ,, uniforms			50,000
,, ,, Sanitation Division			70,000
Harbor and Wharf Office			695,000
Water Works Office			120,000
Telephone Office			120,000
Finance Dept.			80,000
Public Works Office			325,000
Educational Bureau			100,000
Agricultural and Forestry Bureau			68,400
Bureau of Foreign Affairs			40,000
Pu Chi and Li Tsun Hospitals			34,800
Military and Naval Establishments and Courts			80,000
Observatory			20,000
Chemical Research Dept.			30,000
Commercial Museum			6,087
Official Gazette			12,000

Isolation Hospital	$ 22,000
General Miscellaneous	240,000
Total estimated expenditure ...	$2,883,287

In closing perhaps it would not be out of place to give a little description of the City of Tsingtao. It is well laid out, very much like any coast town one would find in any European country. The streets which are well lighted, are wide and having broad sidewalks. The principal streets have sheet asphalt covering, while streets on steeper grades are all paved with granite stone blocks. The architectural effect is principally German, interposed with foreign style houses built by the Japanese. There is a modern sewage system and every house has its flush-closet. The houses here are not like those of other cities where they are generally surrounded by a compound wall. The principal attractions are the fine beaches, perhaps the best in the Far East, excellent motor roads, and attractive parks and boulevards. In the summer months people from all over China come here for their summer holiday. During the Japanese occupation the Forest Park was planted full of cherry trees so each year at the end of April hundreds of people from nearby towns as well as the residents of Tsingtao fill the Park to enjoy the beautiful scene of the cherry blossoms and this Cherry Blossom Festival which the Japanese started is being kept up by the present Administration. The hills surrounding Tsingtao are covered with motor roads besides there is a fine motor road of over 38 kilometers leading to the top of the Laoshan Mountains. The Grand Hotel Company operates two large hotels, the Grand Hotel and Annex situated in the centre of the residential quarters and the Strand Hotel at the principal beach. The most imposing building is the present Directorate-General which is of granite construction and contains over 160 large rooms. It was built by the Germans and used as their seat of Government. This buildings, together with the many forts on the hills and around the Bay, reminds one of the former greatness of the Germans and their thoroughness in any undertaking. The population of Tsingtao for 1923 was estimated as follows :—

Chinese	276,700
Japanese	16,800
Other foreigners	430
Total	293,930 (approx)

Taking everything into consideration it is seen that Tsingtao, with its fine and well laid out streets and its superb harbor and excellent wharf facilities, is destined to play an important part in the development of not only Shantung Province but that part of China between the Lung-Hai and the Chung-Shih Railways, and its degree of prosperity will indicate the progress of development in this part of the Country.

Recent Interesting British Launchings

THERE have recently been several very interesting launchings of vessels destined for the Eastern trade, in England, among them being the Alcinous for Messrs. Alfred Holt & Company, the Sirdhana for the British India Steam Navigation Company, Limited, for their regular service and the Malabar for Messrs. Burns, Philp & Company, Limited of Sydney, for their service between Australia, New Guinea, and the Islands of the Pacific. The following are brief particulars of the several vessels.

Alcinous

The Alcinous was launched from the Cartsdyke Shipyard of Messrs. Scott's Shipbuilding & Engineering Company, Limited, Greenock on October 6. She is a twin-screw motor-ship, built for the passenger and cargo service of Messrs. Alfred Holt & Company. The dimensions of the vessels are 425 feet long by 54 feet 6 inches wide by 31 feet 9 inches in depth, with a gross tonnage of about 6,300 tons. The vessel is equipped with 20 powerful electrical winches for the rapid handling of cargo, and complies in every respect with the latest requirements of the Board of Trade and Dutch authorities for passenger carrying, including emergency dynamos, boat-turning-out gear, etc. The life saving equipment consists of 12 large life boats, two of which are fitted with Fleming's patent hand-propelling gear.

All the weather decks are sheathed, and the conveniences for the type of passenger carried are of a very high order. An interesting point in connection with the design of this vessel is that she is the first of Messrs. Alfred Holt and Company's fleet to have the machinery placed at the after end.

The vessel is propelled by two sets of eight-cylinder four-cycle Diesel engines, supplied by Messrs. Burmeister and Wain, of Copenhagen. These engines develop about 3,700 b.h.p. under normal running conditions. The engine room auxiliaries are all electrically driven, as are the deck machinery, steering gear, and refrigerating plant. To supply power for these and also for lighting and cooking purposes four auxiliary Diesel engines, each direct coupled to a dynamo, are fitted in the engine room. In addition to these there is an emergency dynamo situated on the centre castle deck. This supplies current to run the emergency pilge-pump, wireless telegraphy and certain lighting circuits in the event of the main electric units becoming totally disabled. An oil-fired auxiliary boiler is fitted in the engine room, and supplies steam for distilling, fuel-oil heating, etc.

Sirdhana

On October 5, Messrs. Swan, Hunter, and Wigham Richardson, Limited, launched from their Neptune Works a steel screw passenger and cargo steamer named the Sirdhana, which they are building to the order of the British India Steam Navigation Company, Ltd. The Sirdhana is similar to the Santhia, built at the same works for the British India Steam Navigation Company, Limited, which has been running satisfactorily on her service since the early part of the year. The steamer is built of steel with teak decks. She is 450 feet in length by 57 feet 9 inches broad by 36 feet 6 inches moulded, and is designed to carry a deadweight of 9,500 tons on a draft of 27 feet.

The machinery consists of twin-screw triple-expansion steam engines, which, with the boilers are also being constructed at the Neptune Works of Messrs. Swan, Hunter and Wigham Richardson, Limited, and are designed to propel the vessel at a speed of 13 knots. Amidships there will be comfortable well-finished accommodation for 30 first class passengers, including a large dining saloon on the bridge deck, with entrance hall, lounge and smoking room on the promenade deck above. There will also be excellent accommodation for 30 second class passengers on the same decks, including nine state rooms, a dining saloon and smoking room. Part of the upper deck and 'tween decks can also be used for carrying native passengers, up to about 3,000 in all.

The auxiliary machinery includes a steam windlass, steam steering gear, and 12 steam winches, together with the usual derricks, etc. There is electric light throughout. The refrigerating plant installed has been supplied by Messrs. J. & E. Hall Limited of Dartford. Bitimastic solution and enamel has been applied to bunkers, coal shoots, tank-top, boiler-room tank, bilges, shell plating, main inlet box, tunnel well, aft end of poop deck and water-way, upper and main deck stringer plates, as well as covering to the flat of deck plating. The ventilation will be very ample, as the vessel will trade in the Tropics, and there will, of course, be a wireless installation, a large number of steel lifeboats, steam heating, and refrigerating machinery, together with the necessary insulated store-rooms for the ship's provisions.

Malabar

The single-screw motorship Malabar, constructed by Messrs. Barclay, Curle & Company, Limited, for Messrs. Burns, Philp & Company, Limited, of Sydney, for their services between Australia, New Guinea, and the Islands of the Pacific, completed successful trial trips on October 9, the mean speed attained being 14 knots. After the trials the Malabar left for Avonmouth, from which port she proceeds to Sydney with passengers and cargo. Attending the trials on behalf of the owners were Viscount Inchcape and Mr. W. G. R. Snellgrove, whilst the builders were represented by Mr. Noel E. Leek, Mr. William Ewing, and Mr. Archibald Gilchrist.

(Continued on page 747.)

Iron, Coal and Mineral Oil on the Asiatic Coast of the Pacific Ocean

By B. P. Torgasheff

IT appears that just before the Great War, or in its very beginning Wells wrote: "Europe will have to descend from her altitude; the Pacific Ocean will become the arena for the happenings in the world and determine the future of the latter."

Without going into the trend of history or any analysis of the causes, we would only like to state that the above deduction of Wells will appear as perfectly correct to anyone following the evolution of the economy of the world. The Pacific Ocean has become long since already the arena and centre where the economic interests of Asia, Europe and America are interwoven, and the problem of the nearest future of the countries surrounding the same, has certainly been focussed in the universal attention.

The United States of America undoubtedly is the most developed and richest country on the Pacific, however the centre of gravity of the entire Pacific problem has to be looked for not on the American but on the Asiatic shores of this Ocean.

The Pacific coast of the United States cannot boast of its natural resources. Even now, and the more so as the time will pass on, the Pacific States will have to rely upon Asiatic markets both for raw products and the sale of their own manufactured products. As regards the general importance of the Pacific Ocean for America as a whole, one should not forget the words Theodore Roosevelt said, that its future was dependent "upon the other side of the Pacific Ocean."

The general simplified view taken in respect of the Asiatic coast was the same as the one adopted toward colonies in other parts of the world, viz. this coast was considered only as a cheap market of raw products for European and American industries. There are a great many countries which still stick to this point of view, and they will have to pay heavily if they fail in due time to take account of the actual and effective importance of the Asiatic East.

More than one third of the entire population of the earth are congested upon the coast of the Pacific Ocean, and they live in conditions very unsimilar to those prevailing on the Congo or in Borneo. It is true, China became the foremost raw products market for Europe and America, but China's future lies in the domain of industries. It is in this respect that China with a population of almost 500,000,000 is one of the most important factors in the economic problem of the Pacific Ocean.

It is true that China, as well as other parts of the Asiatic coast of the Pacific, has been too little explored, but there may be no doubt that the country possesses great resources both of universal and local importance. Compared to China such countries as Australia, the Netherlands Indies, Indo-China and Siam are but of secondary importance. Japan is comparatively speaking poor in natural resources and this is the principal cause of her desire to expand on the Asiatic continent in order to maintain the level of her industry.

The Russian Far East takes a position quite apart.

Its assets are rich natural resources of worldwide importance, such as mineral deposits and forests, and certain other favorable conditions for the creation of a local Far Eastern industry. But it has certain drawbacks, which at present consist in a sparse population, the insufficiency of ways of communication, which actually deprive three quarters of its territory of any possibility of economic utilization.

However, proceeding to an investigation of the opportunities and prospects of industrialization of any part of the Pacific coast, this part should not be taken as a separate entity and form the point of issue for independent deductions. The central location of China with its population of almost 500,000,000, making the country a market with a potentially very great purchasing capacity, largely offsets the weak point in the Russian Far East, viz. the sparsity of its population. Owing to quite a number of causes, which will be mentioned below, everything is taking such a turn that an industrialization of China will doubtlessly lead to an industrialization of the Russian Far East as well.

Tayeh Harbor

The old viewpoint upon China and other parts of the Asiatic coast as exclusively raw products markets and the attempt to treat them as colonies has already brought many negative results, and created the actual tangle of international relations in the Far East. In an indirect way it is also responsible for the abnormal development of certain branches of industry in Europe and America. On the other hand, and this is the most important, this foreign policy has held up the natural development of industries in all the Far East for several decades. China as an export market is already getting poor, but not because its stock of raw products has become depleted, but owing to more serious economic changes occurring in the country. Actually a great many people realize that the rapidly growing wants of the Chinese population of many millions are creating more attractive prospects for the local manufacturing of certain raw products instead of exporting them abroad. An old tradition induces people to say that China is a wild country and unsafe for the investing of foreign capital ; as a matter of fact, however, other causes are responsible for the fact that capital was not invested in Chinese, industries. Europe and America were against the development of industries in Asia, which might threaten their own industrial enterprises.

Many things have changed since. The War showed that in Europe itself a further concentration of industrial establishments in such larger centres as London and others, was connected with a risk for the capital invested. No more faith is placed into the soundness of the social structure of Europe and by scattering itself all over the world the capital wishes in a certain way to insure its right to further existence.

If in former days foreigners invested their money in China only in raw products and railways necessary to carry the former to the ports, now one may already observe another tendency—to find a way for the investment of funds into the local industry and develop ways of communication of a general industrial importance. It should also be mentioned that native capital is growing in China, though at a slow pace, and it is very characteristic that the same is to be found exclusively in industries which are being organized according to modern European methods.

It is too difficult a task to compound all the data showing the potential opportunities for a development of industries in China.

Certain figures, however, are too characteristic not to be quoted immediately. Thus, for instance, the textile industry in China is only of very recent origin. In 1900 there were no more than 200,000 spindles in China. In 1912 this figure rises to 841,000 and in 1921—to 3,165,000. This industry is growing with a firm pace and in spite of all talkings about the crisis in China, it still manages to find the necessary funds.

The consumption of cotton piece goods is growing quite as rapidly (in spite of the fact that the average state income of China is calculated at not more than $2.00 per head). Therefore it would be quite unreasonable to say that China could be compelled to depend upon imported piece goods for any length of time. It has become clear a long time ago that the same may profitably be manufactured on the spot. Japan realized this to a great advantage for herself. One may assert with an almost absolute certitude that the textile industry will be one of the most important manufacturing industries in China.

Mr. Julian Arnold, the American Commercial Attache in China, one of the most active leaders of the foreign economic policy in China, considers that the pace of industrialization of China is extraordinarily rapid and, therefore, he foretells that should China develop as rapidly as in the course of the past six years, it will have up to 40,000,000 industrial workmen instead of the several hundred thousand at present.

The political and economic interests of many countries are intricately intertwined on the Pacific Ocean. But the capital will only look for lines of a least resistance, in other words opportunities still untapped. On the Asiatic coast there are two such opportune territories : China and the Russian Far East. Capital will find a good investment in China—in railroads of industrial importance and in the textile industry. The tournament actually fought out between Japan and England for the cotton business, has given tremendous advantages to the former owing to the fact that she began herself to manufacture piece goods for China on her proper territory and in China itself.

Large quantities of metals, machinery, etc. the imports of which will certainly increase in proportion with the development of industries in China, will be required for the construction of railways and the textile industry. A normal development of the textile industry, however, and a regular commercial, not only concessionary, building of railroads are calling for the creation of a native metallurgic industry in the Far East.

Compared to America or England the Asiatic coast of the Pacific Ocean—inasmuch as it has been explored so far—does not seem to be very rich in iron ore and coal deposits. Therefore a

General View of Hanyang Iron and Steel Works

Furnaces and Principal Coal Workings

very important question arises where to find the most convenient spot for the formation of a metallurgic centre. This matter is of such importance that it is being studied practically already. For the time being it is difficult to say where a native metallurgic industry will arise on the Asiatic coast and the scale of such an industry. This question is not quite clear as yet. One thing, however, may be considered as certain that is, that the favorable natural conditions will vest the Russian Far East with an important part in this direction.

Coal

The metallurgic industry requires coal and iron and the same must be obtainable in especially favorable combinations as regards their relative deposits and the corresponding qualities for the coal and ore. On the Asiatic coast of the Pacific Ocean one finds coal and iron ore deposits. This coal and ore, however, has been so little prospected for the time being, that there is not the slightest possibility to establish with more or less certitude the location of the centre of the future metallurgic industry in the Far East.

Japan is the only country in the Far East where prospectings have been undertaken in a satisfactory way, but their results were negative. The Japanese isles are generally poor in deposits of ore, particularly iron ore. The Japanese coal is poor in quality and its deposits are insignificant in comparison to the pace at which industries are developing in the country.

A West China Oil Well

According to Japanese sources of information and placing on record all the known coal deposits in the insular empire, including deposits of a width of not less than 2 feet and a depth of up to 2,000 feet below the sea level, the entire coal deposits of Japan are estimated at only 822,000,000 tons as against 3 billion tons in the Russian Far East and 23 billion tons of Chinese coal.

The Pacific coast of the United States is very well prospected, but its coal deposits are not very considerable. They suffice only for the requirements of the native American industries at their present stage of development and for a period of approximately from 25 to 30 years. The total coal deposits of the entire territory of the United States are estimated at 4,200,000,000 tons, but the local consumption is tremendous. The United States consumes annually over 700,000,000 tons. For a number of years already America has experienced a shortage of fuel which was covered only by kerosene. There is therefore nothing astonishing in the well known fact that in recent years the United States very attentively investigated the question of a possible organization of the supply of cheap Chinese coal to the United States.

The coal deposits of Australia are estimated by the Statesman's Year Book at 166,337,000,000 tons and owing to quite a number of reasons they may be considered having a purely local importance only.

In Indo-China the largest coal deposit is the one of Honggay, not far from Haiphong. The latter is also of a purely local importance.

The only countries possessing more or less abundant and free coal reserves on the whole Pacific coast are the Russian Far East and China. Inasmuch as one approaches these reserves from the standpoint of figures they do not appear very considerable. However, the still unexplored enormous areas in the Russian Far East and China, particularly in the first-named country, give a hope to expect a discovery of new large deposits of coal and ore.

According to even most conservative estimates of the more or less known deposits of coal in China and the Russian Far East, they contain a reserve of up to 27,000,000,000 tons of coal.

Out of this quantity according to calculations of Drake and Inouye the reserves of China consist of :

6.252 million tons anthracite
17.183 ,, ,, bituminous coal,

or a total of 23.435 million tons of coal.

The figures of Ahnert and Polevoi, which cover only a few of the more or less known deposits, show that the coal reserves in the Russian Far East represent about 3,000,000,000 tons, of which 2,000,000,000 are Sakhalin anthracite.

There exist certain more optimistic statements regarding the coal reserves in China. Thus, for instance, Prof. Ting, representative of the Chinese Geological Committee at Peking, estimates the coal deposits in China at 45 billion tons. Julean Arnold, American Commercial Attache in China and the American Professor Fernand, the latter having especially come to China for this purpose, state that the coal reserves in China are of up to 1,200,000,000,000 tons.

Any more or less systematic prospecting has never been effected in China nor has even a simple inspection ever been made of all coal deposits in a very few districts. It is, therefore, difficult to say which of the above figures is nearer to truth. In any case the coal deposits in China consist of many billions of tons.

Taking Prof. Ting's figure of 45 billions tons as probable then at the rate of the English and American normal consumption per individual (about 6 tons per individual) this reserve would suffice for only 15 years. The present-day consumption of coal in China, however, represents only the modest figure of 2.6, poods per individual (20,000,000 tons per annum for 450 million individuals).

The principal deposits of coal in China lie at a rather great distance from the industrial centres of the country. The principal coal mines are in Shansi province, where the reserve is estimated at 5.800 million tons. Other deposits are in the provinces of Chihli, Honan, Hunan, Szechuan, Shansi, Yunnan and Kweichow.

Compared to the number of Chinese population the actual output of coal in China is quite insignificant. In recent years the total production of coal in the whole of China amounted to about 40,000,000 tons, of which Prof. Ting estimated that 20,000,000 tons were produced with modern mining methods and the balance by crude native mining procedure.

Government statistics for 1920 give the following figures for the total output of coal in China (exclusive of Japanese mines):

	Tons.
Chinese mines with modern equipment ...	3,720,000
,, ,, ,, primitive native ...	6,020,000
Government owned mines	780,000
Foreign mines	8,980,000
Total	19,500,000

The most important mines in China are those controlled by Japanese and British capital, to wit :

(*a*) The Fushun mines owned by the South Manchuria Railway, with a yearly production of about 3,000,000 tons.

(*b*) The Kailan mines of the Kailan Mining Administration, controlled by British capital. Located in Chihli province. Annual output about 4,000,000 tons.

(*c*) The Pinghsiang mines in Hunan near Hankow. They work for the Hanyang Iron Works and produce up to 1,500 tons of coke per day.

The existing knowledge of the Chinese coal shows that only very few of its sorts are suitable for metallurgic purposes. If we add to this that the reserves of some of the best coal are already under direct or indirect control of Japan—in South Manchuria and on the Yangtzekiang, we will understand that the opportunities for large foreign capital to invest in the metallurgic industry are getting smaller from year to year.

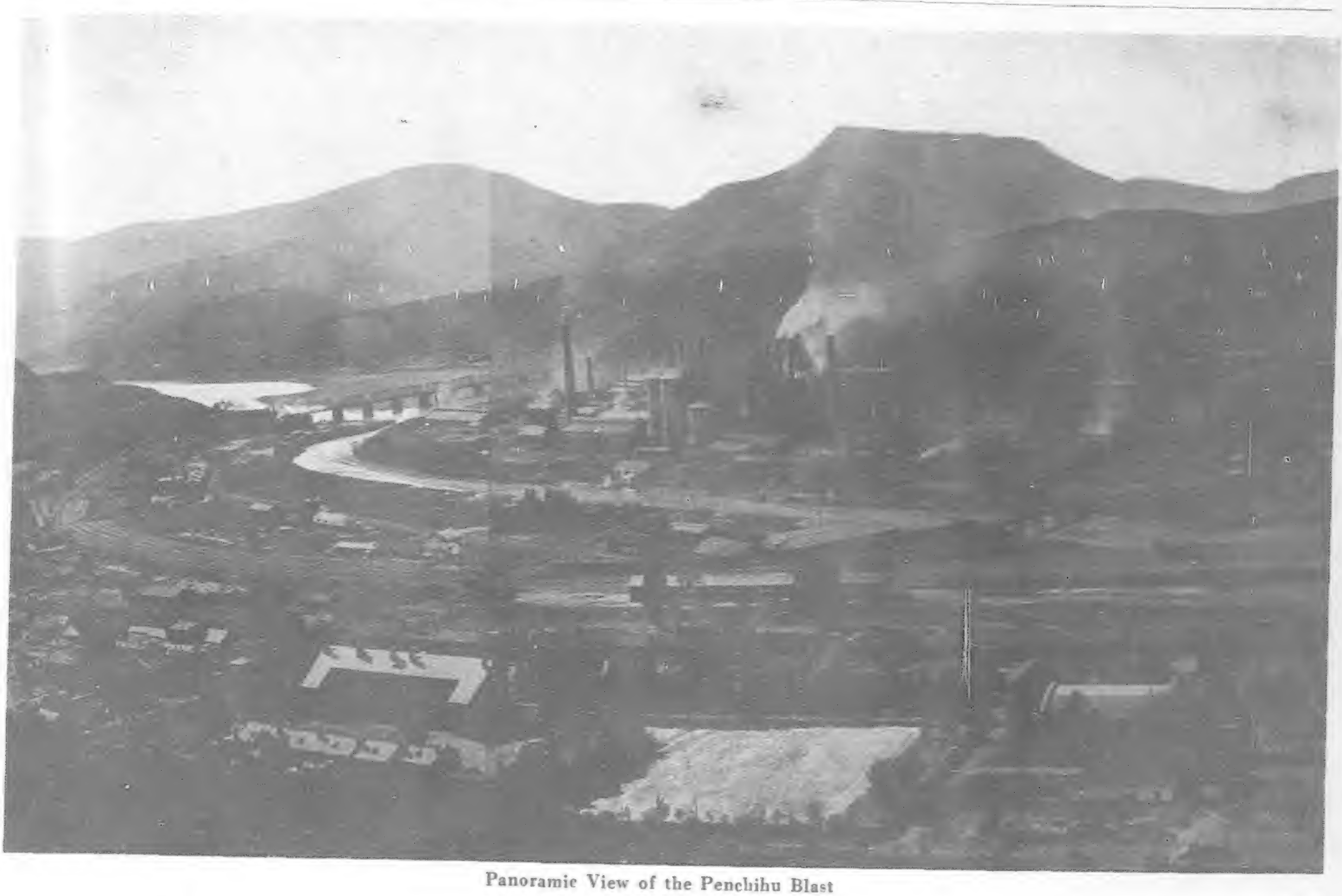
In respect of the Russian Far East the position is different, in spite of the above mentioned lesser (as compared to China) figure of the coal reserve. Generally speaking, the coal reserve of the Russian Far East has never been exactly and completely summarized, and therefore it would be premature to compare the respective figures with those established for China. Polevoi and Ahnert are known by the conservatism of their estimates and deductions and their figures are not comparable to the compilations of the American Arnhold. Arnhold, Ting, Drake and Inouye have calculated thousands of billion tons of coal on the entire territory of China, of which as a matter of fact three quarters are just as little explored as regards coal reserves, as the Russian Far East.

Ahnert and Polevoi simply exclude from their summaries such deposits which have only been registered but not investigated. Their estimates do not cover large districts in Transbaikalia and the Maritime province, nor do they include the entire province of Kamchatka and a considerable part of Amur province.

Regarding the above quoted estimates of the coal and iron reserve of China and the Russian Far East the following should be noted. An exact investigation of the mineral resources of any country stands in direct proportion to its industrial development. We know, for instance, that the British coal reserves are of the maximum extension, because the industrial position of England made it possible to explore all coal deposits and even seams of a two inch thickness. America is also very well explored, however, had it remained in the same state of development as China, its coal reserves would probably be estimated in very modest figures. Provide China and the Russian Far East with a railway net such as in the United States, and then one may presume, that the coal reserves in the Far East will be expressed in much larger figures than the known enormous reserve in America.

Up to the present time the Russian Far East produced only quantities sufficient to cover its own needs. Thus the general consumption amounted to 120 million poods, of which the railways used up to 70 million poods, the remaining 32,000,000 poods being consumed for other requirements.

The Fushun Mines



Panoramic View of the Penchihu Blast

Out of this total quantity Sakhalin supplied 5 million poods and the Maritime province—42 millions. The Geologic Committee estimated the total coal reserve in the Russian Far East as follows :

	Lignite	Bituminous coal
	[millions of tons]	
Transbaikal province	100	—
Amur province	400	5
Maritime province over	50	300
Sakhalin Island, over	10	2,000
Total over	560	2,305

The figures, certainly, do not cover the known but yet unprospected coal deposits in a large area of the provinces of the Amur and Kamchatka.

Taking the Russian Far East such as it is now, it should be said that all its coal, except certain coal mines in the Maritime province and Sakhalin, is of only local importance. However, certain coal deposits in the Amur province, and particularly the deposits in Kamchatka, as soon as they are prospected, may easily obtain a great importance for the outside world. A number of coal deposits in the Maritime province and the coal in the Russian half of the island of Sakhalin, are undoubtedly located most favourably for the purposes of metallurgy in the whole of the Far East. Their quality is appropriate and iron ores are found quite near from them.

From the estuary of the Amur river there stretches to the north-east a coast line of a length of almost 4-5,000 versts, which has geologically very little been explored. Coal deposits have been found there in quite a number of spots. Should even only a few of these deposits consist of high grade coal, their value will nevertheless be very considerable, because one may trust that they will be important for the whole of the Far East.

Iron

As regards the reserve of iron ore, it should be said that both China and the Russian Far East have even less been surveyed in this respect than in the respect of coal. For the Russian Far East there exist the conservative calculations of Ahnert, covering, however, but seven prospected deposits of iron, and only for the time being, we consider them the largest. It should not be forgotten, however, that not seven but more than one hundred various deposits of iron ore have been placed on record in the Russian Far East. Thus in 1923 the Far Eastern Geologic Committee kept a record of 137 registered deposits of iron ore, viz.;

in Transbaikal province	70
,, Amur province	22
,, Maritime province	36
,, Kamchatka province	9
Total	137

It will remain to the future to establish the nature and importance of these deposits.

According to the summarised records of the Geologic Committee (in 1923), the seven explored deposits of ore have the following composition :

	In million tons				
	Magnetite	Bog-ore	Hematite	Iron sands	Total
Olga and Sudzukhe ...	1.95	0.11	—	—	2.06
Sergievskoie	0.15	0.12	—	—	0.27
Posiet	—	—	—	1.11	1.11
Nikolaevskoe	—	0.8	—	—	0.8
Malohinganskoie ...	—	—	2.6	—	2.6
Transbaikalia [Baliaginsk]	2.2	—	—	—	2.2
Total	4.3	1.03	2.6	1.11	9.04

Ahnert estimates that the total ore in these deposits amounts to only 294 million poods, or 4.9 million tons, distributed as follows :

Olginskoie	...	...	...	...	120	million poods
Sudzukhe	...	...	...	...	14	,, ,,
Sergievskoie	...	...	...	...	14	,, ,,
Malohinganskoie		...	...	...	50	,, ,,
Nikolaievskoie	...	...	...	...	50	,, ,,
Baliaganskoie	...	...	...	...	46	,, ,,

According to calculations made by the Vladivostok Geologic Committee the above mentioned 9,040,000 tons of the ore contain about 3,930,000 tons of metallic iron.

John Cook, an American who recently lived several years in the Russian Far East, published in the foreign press (The China Weekly Review) his data regarding the mineral riches of Eastern Siberia, wherein he estimates the reserve of iron ore in the Russian Far East at 565 million tons. Compared with the data of the Geologic Committee this figure is absolutely phantastic, but still it is very characteristic inasmuch as it prove the easiness with which Americans are apt to describe unexplored regions in figures of millions and billions, as we saw above in respect of the mineral resources of China.

The most optimistic Russian estimates of the more or less surveyed deposits in the Russian Far East so far have given the figure of 900 million poods, or 15 million tons of ore, however, without taking into consideration more than a hundred of registered though unsurveyed deposits in the Transbaikal, Amur and Kamchatka provinces, no Russian geologist having as yet ventured to guess at the approximate importance of these reserves.

The normal demand for iron in the Russian Far East equalled about 4 million poods of metallic iron before the war, which would necessitate an annual output of 8 million poods of ore and 10 million poods of coal, provided that the iron be produced on the spot. As a matter of fact this was not the case. The only iron works in operation in the Russian Far East — the Petrovsky Works in Transbaikalia, used 490,000 poods of ore as a maximum, producing 242,000 poods of pig iron. All the other iron was always received from the Ural.

As regards coal, the iron ore deposits of the Russian Far East are in a markedly unfavourable position in Transbaikal province, where there are many (70) iron ore deposits, but almost no coking coal is to be found. The Malohingansk deposits of hematite find an appropriate coal only in China in the estuary of the Sungari river, or must obtain the same from Sakhalin by the Amur river way. However, there is a hope that a survey of the Bureinsk coal will improve this unsatisfactory position. The Nikolaievsk deposit as well as certain ore deposits in the Maritime province find the necessary coal both on Sakhalin island and in the Maritime province.

There exist no authoritative data regarding the reserve of iron ore in China. The Chinese Geologic Committee* published a respective summary for the first time on 1921, with the reservation, however, that it had taken the figures from various foreign sources, and that undoubtedly these figures were considerably exaggerated. This survey estimates the total ore reserve in China at 677,099,000 tons, containing about 350 million tons of metallic iron. The principal deposits of iron ore are located in the following provinces of China :

Chihli	...	...	...	91,479,000	tons of iron ore	
Hupeh	...	...	...	52,660,000	,,	,,
Anhwei	...	...	...	50,000,000	,,	,,
Mukden	...	...	...	387,580,000	,,	,,
Kiangsu	...	...	...	35,000,000	,,	,,
Shantung	...	...	...	29,000,000	,,	,,

A maximum estimate of the possible reserve of iron ore in China establishes the same at about 1 billion tons, in other words it equals $\frac{1}{4}$ of the reserve of the United States, 4/5 of the reserve of the United Kingdom, $\frac{1}{3}$ of the reserve of France and $\frac{1}{3}$ of the reserve of Germany.

Of the known deposits the most favourably located in respect of coal are the iron ore mines in the province of Hupeh, in the Yangtze valley, in the district of Tayeh. By granting a loan in 1912 to the Chinese Hanyehping Company Japan placed under her de facto control one of the most interesting metallurgic combines in China, viz, the Hanyang Iron Works in the vicinity of Hankow, the Tayeh iron mines and the Pinghsiang coal mines. We do not know whether the respective figures are exaggerated or not, but Dr. Hsi Kung-Chen in his work entitled " Contemporary China," says that the reserve of the Tayeh iron mines may be estimated at about 700,000,000 tons.

At the present time according to recent statistics the annual production of iron ore in China amounted to 1,400,000 tons, of which over 300,000 tons are exported to Japan and over 1,000,000 tons are manufactured into iron in China itself, mostly by Japanese capital. *These figures, necessarily are not complete,* because the production of metallic iron at works amounted to 500,000 tons and by crude native manufacturing methods—to 300,000 tons. There exist eight metallurgic works in China of which two are still in construction, which will soon be finished. The principal of these are as follows :

1. The Hanyang Works near Hankow, with a yearly output of about 150,000 tons of iron.
2. The Anshan Works at Moukden, with an output of 150,000 tons met. iron.
3. The Penchihu Works, Moukden, with an output of 80,000 tons met. iron.
4. The Kailan Mining Administration, Chingwantao, with an output of 80,000 tons of met. iron.

According to official information of the American Commercial Attache the iron ore reserve of China should be estimated as follows: China disposes of 400,000,000 tons of iron ore appropriate for the smelting of metallic iron with modern methods of manufacturing. Besides the country possesses 300,000,000 tons of ore which is only suitable for the smelting of iron by modern methods, and 300,000,000 tons of ore suitable only for re-smelting by native primitive methods, for purely local needs.

Until quite recently the consumption of iron in China amounted to the very modest proportion of 0.0008 ton per capita (1.9 Russian pound as against 1 pood in the Russian Far East and 10 poods of iron in the United States of America). The population of China, which now approximates 500,000,000 individuals taken at the more conservative estimate of only 450,000,000, therefore, consumes not more than 380,000 tons of iron per year. These figures refer to the year 1916, but the consumption of iron by the people since that year is not considered to have increased, and if the output of iron has been growing recently, this should be explained not by any increased local consumption, but by a special manufacture of iron in China for Japan by Japanese capital. This is the reason why in the export tables of the Customs one finds very considerable figures representing the export of iron from China. Leaving machinery aside, the export of iron from China at the present time almost by 500,000 tons exceeds its import.

According to summarized data for a number of recent years the production of pig-iron in China fluctuated between 200 and 300,000 tons per year, of which quantity from 160 to 200,000 tons were exported, mostly to Japan. At the same time China imported annually over 300,000 tons of iron and steel ; therefore the consumption of iron in China itself may be put at 400,000 tons. According to Tegengren this figure should be increased by 170,000 tons of pig-iron produced in China by crude native methods. Thus, the general consumption of iron and steel in China should be taken as *from 550 to 600,000 tons per year.*

The consumption of iron in China is actually quite insignificant. According to Tegengren, who quotes figures for 1924, the annual consumption of iron per head of the population in China amounted to only 1.4 kilogramms, whereas the average per head consumption in the world equals 40 kgr. The comparative figures are as follows :

United States	...	...	250	Kgr. per. annum & per head	
United Kingdom	...	...	130	,,	,,
Germany	...	...	130	,,	,,
Sweden	...	...	85	,,	,,
Russia	...	...	30	,,	,,
Japan	...	...	14	,,	,,
China	...	...	1.4	,,	,,

Admitting a rapid development of the present low industrial standing of China toward the present position of the Russian Far East with its consumption of one pood of iron per head of the population, then the 450,000,000 individuals in China will annually demand 7,500,000 tons of iron, or for manufacturing of the same—a

*Presumably the Geologic Survey of China

minimum of 15,000,000 tons of ore. With such an average the total reserve of iron ore in China, which is estimated at a maximum of 1,000 billion tons, will last for 66 years only. With the American rate of consumption the entire iron ore reserve in China would suffice for only 5 years.

An attempt of a general summary of the reserve of iron ore in all the territories bordering upon the Pacific Ocean was made by F. Tegengren in his book entitled " Iron ore and metallic industry in China " published in 1924. He estimates all the known and probable deposits of ore as follows :

	tons
China	950,000,000*
Netherland's Indies	800,000,000
Pacific Coast of the U. S. A.	300,000,000
Australia and New Zealand	345,000,000
Pacific Coast of South America	264,000,000
Philippine Isles	200,000,000
Japan and Korea	80,000,000
Malay Peninsula and Br. North Borneo ...	25,000,000
Russian Far East	5,000,000
French Indo-China	moderate
Siam	,,
Canada	,,
Mexico	,,
Total ...	... 2,969,000,000

According to 1920 statistics quoted by Hatch and Kuhn, the known reserve of iron ore in the world is estimated at from 31 to 32 billion tons, with a possible maximum (according to Kuhn) of even 100 billions. If one considers these figures, then the ore reserve of all the countries surrounding the Pacific Ocean represents 9 per cent. only of the known world reserve, and taking the estimate of supposed other deposits—only a little over 2 per cent.

All the Pacific countries as a whole actually consume only 5 per cent. of the world's consumption of iron and metallurgic industry is still so little developed on the Pacific Ocean, that out of these 5 per cent. only one third is manufactured by the domestic industry in these countries.

According to rough calculations made by F. Tegengren the countries on the Pacific Ocean consume the following quantities of iron :

	tons	
Pacific Coast of the U.S.A. ...	1,500,000	
Japan	1,200,000	
China	400,000	(manufactured by modern process).
Australia	400,000	
Netherland's Indies	200,000	
Russian Far East	100,000	
Philippine Islands	100,000	
Indo-China	100,000	
New Zealand	100,000	
Pacific Coast of S. America ...	100,000	
Total ...	4,220,000	

According to statistics of recent years Japan consumes 1,500,000 tons of iron and steel every year, of which over 650,000 tons are produced in Japan proper, Korea and Manchuria and the balance imported. Japan proper, according to Tegengren, scarcely produces more than 250,000 tons of ore, though Japanese official statistics estimate the known and probable ore reserve of Japan at 80,000,000 tons, viz. :

	tons
Magnetite	... 40,000,000
Hematite	... 30,000,000
Lemonite	... 10,000,000

On the Pacific Coast of the United States considerable deposits of high grade ore are found only in California, but they are very inconveniently located beyond the mountain range in a hilly and desert territory. This unfavorable situation is aggravated by the fact that the nearest coking coal is at a great distance from the ore deposits in the states of Utah, Colorado and New Mexico. This explains why pig-iron from Pennsylvania is carried to California and there experiences serious difficulties in competing with imported European pig-iron, which is sometimes sold there 5 or 6 dollars cheaper per ton than the Pennsylvanian product.

Recapitulating the above data of the reserve of iron ore and coal in China and the Russian Far East and comparing them with the reserve of ore and coal in the United States, we get the following figures :

	Millions tons.		
	Russian Far East.	China	U. S. A.
Coal	3,000	23,400 (min.) 45,000 1,200,000 (max)	4,200,000
Iron ore	4.9 9.0 15.0	677 (min.) 700 1,000 (max)	4,000

America produces yearly more than 700,000,000 tons of coal, whereby it is running short of approximately 70,000,000 tons, which it has to replace by oil. Though America's coal reserve is very large, but the location of deposits is far from being satisfactory. The coal on the Pacific coast of the United States is of an average quality only as mentioned above, and its reserve may last for another 25—30 years.

The coal and iron ore of China and Russia, inasmuch as the same are exploited already do not represent any tremendous riches which would warrant an industrial development of the respective countries up to the level obtained in America and England. It is true, at the present time the deposits of ore and coal are scarcely being worked in China and in the Russian Far East, but industries are growing in both regions and they will demand coal and ore in the first place.

Petroleum on the Pacific Ocean

" The country which will secure the control of this most valuable fuel, will put its hand upon the riches of the rest of the world. The vessels of other countries will soon be unable to navigate without its oil. And, if it knows how to create its own mercantile marine, it will easily become the master of the entire world sea-borne trade, because to control the maritime ways of communications means to exact a toll from all the other nations. A process of the concentration of industries will take place in this country and its banks will become the clearing centres for the world. History already knows of one such example, when British coal forced Amsterdam to give up to London the rule over the seas,"—this is how Pierre de la Tramerie characterizes the importance of oil in his book entitled " World struggle for oil," which appeared last year and created such a sensation.

The reserves of coal in the crust of the earth are not inexhaustible and they are distributed in such a way, that almost all the developed industrial countries in the world are anticipating a more or less nearly and complete exhaustion of their coal resources, which may radically overthrow their entire material prosperity. This is why the consumption of coal is growing at a tremendous pace. Whole branches of industries are readjusting themselves, and the ways of communication by sea and by water begin to depend upon this new kind of fuel.

The advantages of oil over coal are enormous. The complete installation of a boring hole costs from 100 to 150,000 dollars and as soon as industrial oil is located the subsequent expenses will be trifling. However, coal mines of a secondary importance very often demand a spending of many millions before the first ton of coal is ready for sale. A reduction in the number of labor required represents an enormous saving. Finally, and this is most important : oil possesses very great technical advantages as a fuel.

Crude oil used as a fuel by ships increases the radius of their activity by a least 50 per cent. as against coal. With interior combustion engines the radius of activity of ships is trebled according to general opinion. Quite recently British shipbuilders assert that for shipbuilding industry one ton of oil will be the equivalent of 6 tons of coal. It will suffice to say that even with the present standing of industry a ship equipped with Diesel motors (for oil) can carry in her bunkers a fuel supply sufficient for 57 days of uninterrupted navigation, whereas the maximum period for coal-burning steamships is only 14 days.

*Of these 396,000,000 represent known deposits, and the remaining 550,000,000 tons-probable but unprospected ones.

These advantages of oil and the growing prices of coal caused more than 50 per cent. of the world's tonnage to use the oil fuelling in 1920. New ships are built almost exclusively with interior combustion engines, and old vessels are also gradually being converted into oil-burners. Since 1911 the mercantile marine of the United States consumes 15 million barrels of oil per year. The American railroads annually consume more than 50 million barrels. The largest quantity of oil, however, is used on overland roads in America, i.e. by the automobile traffic. Thus, in recent years the United States consumed up to 85 per cent. of its oil output for the automobile traffic. In a number of other countries this replacing of one kind of fuel by another is also to be observed, not to the same extent however, as in America.

The world's production of oil equalled 759,030,000 barrels in 1921 (1 barrel has 36 gallons ; 6 barrels equal one ton [by weight]). Between the years 1913 and 1921 the world output of oil has doubled and it continues to grow from year to year. In 1921 the output of oil was distributed as follows by countries.

	In thousands of barrels
United States of America	469,639
Mexico	195,064
Russia	28,500
Netherland's Indies	18,000
Persia	14,600
Rumania	8,347
India	6,864
Japan and Formosa	2,600

Poland and Peru produce over 3 millions barrels each, whereas all the other countries have a lesser output than Japan.

In 1901 Russia gave 50 per cent. of the of the world's output of oil, but in 1912 her proportion declined to 20 per cent. already. However, Russia continued to maintain the second place. The principal oil fields were located at Baku where over 800,000 tons of oil were produced annually.

According to Russian official statistics the output of oil in Russia was as follows (in thousands) :

	poods	tons	barrels
1913	564,000	9,400	56,400
1918	245,000	4,080	24,500
1919	273,100	4,500	27,310
1920	232,000	3,800	23,200

In the pre-war years of 1911 to 1914 the annual production of oil was between 560 and 570 million poods. About 69.5 per cent. of this output came from the Baku district before the war and 13.2 per cent. from Grozny. In recent years the Baku district produced the following quantities of oil :

From May to May	Output in tons
1920—21	2,537,000
1921—22	2,799,000
1922—23	3,340,000

In the pre-war years Russia used to export only small quantities of oil, consuming it for her own requirements. Thus the export figure for 1913 is 55,495,000 poods or 5,500,000 barrels.

In the years after the war the official statistics show that the export of oil from Russia amounted to

19,846,000 poods in 1922—23 and
44,156,000 ,, 1923—24,

or 65 per cent. of the pre-war exports.

Since 1918 Mexico has taken the second place among the oil producing countries of the world, her share being about 25 per cent. of the world production.

The world's reserve of oil, as far as the same has been estimated at the present moment, is calculated at 60,000,000,000 barrels according to data furnished by de la Tramerie. Out of this quantity only 7 billion barrels may be produced on the territory of the United States, the balance of 53 billion barrels being located in other countries in various parts of the world. According to data supplied by Melik-Nubaroff the oil reserve in European Russia alone equals 10 billion barrels, or 1/6 of the entire world reserve.

The United States is both the principal consumer and the principal producer of oil in the world. At the present time the United States uses up to 400,000,000 barrels yearly, or an annual average of 70 barrels per head of the population. Almost the same quantity of oil is consumed by the countries in the rest of the world, and their annual consumption is progressing from year to year.

It has been calculated that within the nearest decade the United States will require for its domestic consumption up to 500,000,000 barrels per year. During the same period a large increase in the oil consumption will undoubtedly also occur in other countries. Though the United States possesses only 1/7 of the of the world reserve of oil, still New York up till now has controlled the prices for the world market in oil, because about 70 per cent. of the world output of oil came from the territory of the United States.

In spite, however, of the allmightiness of the largest American oil trust—the Standard Oil Company, the capital of which has grown to U.S. $1,310,000,000,—towards the end of the world war the United States was confronted by another oil trust—the Royal Dutch-Shell of not lesser might and importance (a combine of Dutch and British interests, the policy of which is directed by Great Britain).

The skillful struggle for power with the Standard Oil Company moved along two lines. In the first place, before the Standard Oil Company had realized that the domestic reserve in the United States was insufficient for a complete and permanent control of the market, the Royal Dutch-Shell Company in the meanwhile seized the greater part of all the more important oil deposits in almost all the countries of the world and was unsuccessful only in its attempt to seize the Russian oil (Genoa Conference). Since 1919 the Standard Oil Company began to try to seize new oil deposits in different parts of the world, but wherever its expeditions were sent, they found the doors already closed.

Moreover, the Royal Dutch-Shell managed to penetrate even into the territory of the United States and towards the year 1921 it had seized the financial control over 43 per cent. of the entire output of oil on the territory of the United States, in the result of which fact at the present time the Standard Oil Company refines only 49 per cent. of the American oil, against the former 90 per cent. The Royal Dutch Company has taken a firm hold in a number of states rich in oil, such as Texas, New Mexico, Colorado, Utah, Arizona, Montana, Dakota and Nevada. On the Pacific coast it possesses strong interests in California having seized about 75 per cent. of the entire output in this state.

At the present time the Royal Dutch Company produces over 90 million barrels per year and controls a capital of 22,000,000,000 gold francs. One of its last conquests is the almost complete seizure of the Mexican oil, the control over the Suez Canal, and, which is very characteristic—over the Panama Canal as well.

This is not the place to dwell upon the political aspect of this beginning struggle for oil, but it would be necessary to note that the Pacific Ocean will certainly have to become one of the greatest battle grounds of this economic oil war (unless this war becomes of a wider scope).

The Pacific Ocean is already now the arena of the largest international commerce. The future of the United States, as seen by Roosevelt and many others depends, if not absolutely, at least very closely upon relations with the markets on the coast of Asia. Asia and Oceania taken together provide raw products to the United States for a value of over one billion gold dollars. Its tonnage on the Pacific Ocean is large even now and is progressing from year to year. The Asiatic coast is very densely settled, its population equalling one third of the entire population of the globe. Its industry is gradually paving its way and its economic opportunities are tremendous.

As stated above, oil is accompanied by quite exceptional opportunities as regards the expansion of economic influence in new markets. Oil is to be found in several points on the Pacific Ocean and in very large quantities. It is, therefore, more than probable that oil will play not a small part in the beginning Pacific era of human history.

As a small illustration of the opportunities oil may find upon the Asiatic coast of the Pacific Ocean one may point to the extensive plans of the United States (which were not realized owing to protests on the part of England, Russia and Japan), to cover China with a system of railways and organize regular automobile traffic routes in interior of China and Mongolia. According to these plans it was proposed to supply these new ways of communication with 120 million barrels of American oil yearly.

On the Pacific shore of the United States oil occurs (leaving aside Alaska, which has but little been prospected in this respect, and where no work has been started so far), in California only, where it is found in large quantities. However, in California it is mostly not owned by Americans, but controlled by the Royal Shell interests.

Besides, oil is to be found in Columbia, Peru, Bolivia, Chile and the Argentine, where all the principal deposits are also controlled by the Royal Shell. In the southern part of the Pacific Ocean oil occurs in New Zealand and the Netherland's Indies, particularly rich seepages being discovered in the island of Borneo. This oil is also owned by the Shell interests.

On the Asiatic shores of the Pacific Ocean oil was discovered in China, where in the province of Shansi the Standard Oil Company holds a concession. It is expected that a line of oil deposits stretches from the coast in the direction via Shansi to Burma. Indications of Oil are found on the north-western border of China with Mongolia and also in Szechwan and Kansu provinces. Small reserves of oil exist in Japan, as we shall see below. In the Russian Far East oil occurs in several localities, and it seems that in great quantities it is to be found in Russian Sakhalin. Lastly, new discoveries of oil deposits, which are very promising, have been made in Kamchatka.

The pace at which the domestic consumption is growing in the United States does not admit of any possibility of large American exports of oil to the continent of Asia. The Australian and Borneo oil products will principally move in the direction of European exports, which tendency may be observed even now. For this reason, obviously, all the countries intending to remain political factors on the Pacific Ocean, will have to look out for and seize oil reserves on the Asiatic coast of this Ocean.

The Standard Oil Company obtained its concessions in the province of Shansi in 1914. According to American reports the Company spent about US$2,000,000—and found oil suitable for industrial purposes, however, in insufficient quantities to proceed to an immediate work. These reports, however, refer to the beginning of works in this province, when the holes bored did not exceed 2,000 feet. The work is being continued but the results ar unknown.

Oil is of tremendous value and importance for Japan, which requires it both for her navy and mercantile marine. For the navy alone a ready reserve must be held of 64,000,000 tons for war-time emergencies. The domestic oil reserve in Japan, however, is quite insignificant and the oil itself is of low quality.

The output of domestic oil in Japan is insufficient even is spite of the very low consumption of the country at the present time. Owing to this fact more than 50 per cent. of the oil produced in Japan has to be imported, as shown by the following figures for 1920 :

	Domestic output cases	Imports cases
Kerosene	1,174,000	2,725,000
Gasoline	663,000	226,000
Lubricating oil	1,657,000	326,000
Light oil	2,214,000	176,000
Total	5,708,000	3,493,000

An acute demand for oil and the shortage of domestic resources explain Japan's insistance to obtain oil concessions in Russian Sakhalin, and such facts as for instance the distilling of oil from oil-containing shale in the province of Mukden, and, finally, serious experiments made in the laboratories of the South-Manchuria Railway Company at Dairen to obtain an oil for industrial purposes from Manchurian soya beans.

It would be premature to make a definite statement regarding the oil opportunities in the Russian Far East. It is widely known however, that the Sakhalin oil certainly is an oil of industrial importance, and that this importance obviously is considerable if first the Americans and then the Japanese were so keen after getting the respective concessions. Seepage have also been discovered in the system of the Lena river. They have not been prospected so far, it is true, but will have a convenient water outlet towards the Pacific Ocean by the Nelkan and Ayan rivers. Adding to this the Kamchatka oil, which is also an industrial oil as may be deducted from the reports made by Polevoi, then one will realize that the Russian Far Eastern oil may soon become a most important factor in the economy of the Pacific Ocean.

Recent Interesting British Launchings

(*Continued from page 738.*)

The leading particulars of the Malabar are as follow :—

Length 360 feet, breadth moulded 48 feet 6 inches, depth to upper deck 25 feet 3 inches ; gross tonnage 4,500 tons ; deadweight carrying capacity 4,600 tons. The vessel has been built under special survey to Lloyd's 100 A. class, in addition to which she embodies all the requirements of the British Board of Trade and the Australian Navigation Act.

The propelling machinery, which has been installed by Messrs. John G. Kinnaid & Company, consists of one set of Burmeister and Wain type Diesel engines on the four-stroke single-acting principle, having eight cylinders developing 2,700 b.h.p.

Accommodation is provided for 163 passengers in one, two, and four berth cabins, with large, airy public rooms, consisting of dining saloon at fore end of the bridge, with an auxiliary dining saloon on the upper deck, also smoking saloon and music room whilst the main entrance on the bridge deck has an open balustrade well immediately above the dining saloon, and is furnished as a lounge.

All of the state rooms and public rooms are tastefully furnished and decorated, and the problem of keeping the rooms cool and airy has been met by the provision of mechanical ventilation on the punkah louvre system. Large insulated store and provision rooms are provided, and the entire 'tween decks forward are insulated for the carriage of fruit and frozen meat, the necessary temperatures being maintained by two CO2 refrigerating plants. The refrigerating plant installed has been supplied by Messrs. J. & E. Hall, Limited of Dartford. The cargo-handling arrangements are very complete, consisting of five large hatches served by ten electric winches and fourteen derricks working on the Union purchase system. The steering gear and windlass are electrically driven, and the passenger galley range is oil-fired.

The Dredger "Woodford"

Messrs. William Simons & Co., Ltd., Renfrew, launched from their Works to-day (3-9-25) the Twin Screw Bucket Hopper Dredger "WOODFORD" which they have constructed for the Port of Spain, Trinidad.

As customary with the Builders, the "WOODFORD" was launched with all its machinery on board, complete ready for work.

The Hull and Machinery have been constructed to Lloyd's highest class.

The Hopper has a capacity of 150 tons, the bucket ladder being designed to dredge to a depth of 24-ft.

The vessel is propelled by two sets of compound surface condensing engines, steam being supplied from one cylinderical Multitubular Boiler, arranged for burning coal or oil fuel.

The "WOODFORD" has been built under the direction of Messrs. Coode, Fitzmaurice, Wilson & Mitchell, Consulting Engineers to the Crown Agents for the Colonies.

As the vessel left the ways, she was named "Woodford" by Mrs. Carmichael of London.

Machinery Manufacturing Industry in Japan

By Eisaburo Kusano

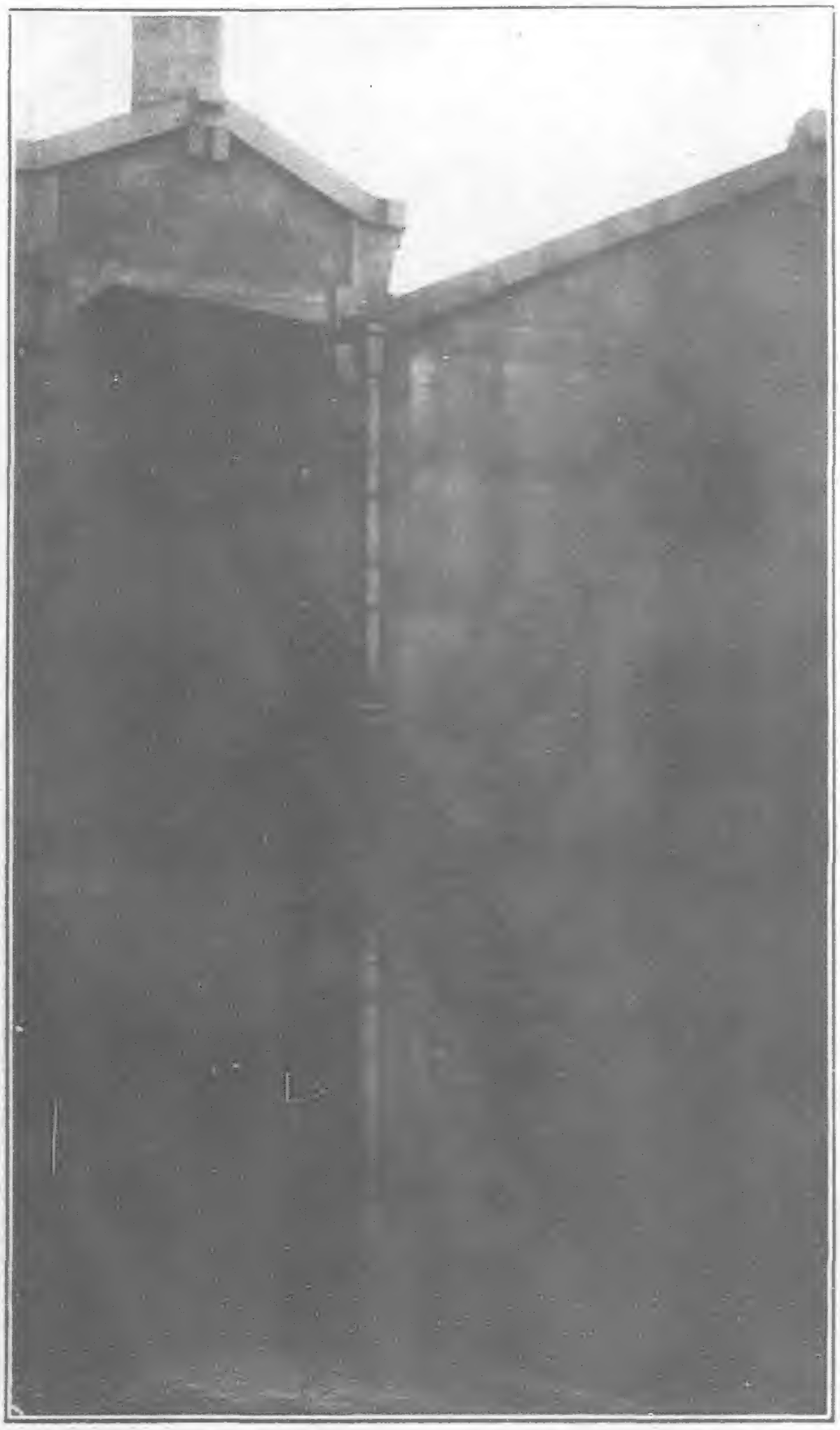
THE machinery and machine tool manufacturing industry in Japan now stands at a turning point whether it will remain one of Japan's important industries and make further developments, or whether it will retrograde to a position of less importance.

Like most of the important manufacturing industries of Japan to-day, machinery and machine tool making was first indroduced into this country by the Government, which built the first machinery manufacturing workshop at Mita, Tokyo in 1879. Eight years later, Shibaura Seisaku-je (The Shibaura Workshop) was erected by Mr. Tanaka, this being the first private owner machiney manufacturing workshop in Japan. In 1890, the Hiraoka Rolling Stock Manufacturing Works was founded. Following the leadership of these factories, the machinery and machine tool manufacturing industry has made a gradual but steady progress. Immediately after the Sino-Japanese War there were 170 of these workshops, including 30 plants which used motors. The number of workmen totalled at 7,849, at that time.

During the war boom, which followed the Russo-Japanese war the number of works and workers were increased almost by four times. But drastic business readjustment was bound to come after such an extraordinary development, and when the business depression set in, both the number of workshops and work men registered sharp decreases.

The outbreak of the European War, however, brought an unprecedented activities of the manufacturing industry in Japan, as Japan's market abroad was immensely extended owing to the absence or decrease of supplies from the European countries.

The development of the shipping resulted in the prosperity of the iron casting, boiler making, and the manufacture of various other materials. There are many workshop outfits, the manufacture of which began during this war boom in Japan. Indeed, the present day progress of the machinery and machine tool manufacturing industry in Japan was mainly attained during this period, when the advanced European countries were too busy to pay attention to their industrial activities. When the business depression set in following the cessation of the war, however, all branches of this industry, like other lines of business, began suffering from the depression. The revival of the manufacturing industry in the advanced European countries was particularly responsible for the depression. The decrease in the demand for arms, in addition, gave a heavy blow to Japan's machinery manufacturing industry. The shipbuilding industry, which is the largest in scale of the machinery producing enterprises, was the first to suffer from the depression, and other workshops also shared the difficulty of maintaining the operation.



Trough pan conveyer, capacity 30 tons per hour, manufactured by the Japan Elevator Mfg. Co. Installed at the Power Plant of the Godo Cotton Spinning Co., Ltd., Osaka.

The following table gives the rise and fall of the machinery producing industry in Japan, before, during, and after the European War :

(In Y.1,000)

Items : No. of Works Y.387 1913, Y.590 1918, Y.526 1920 ;

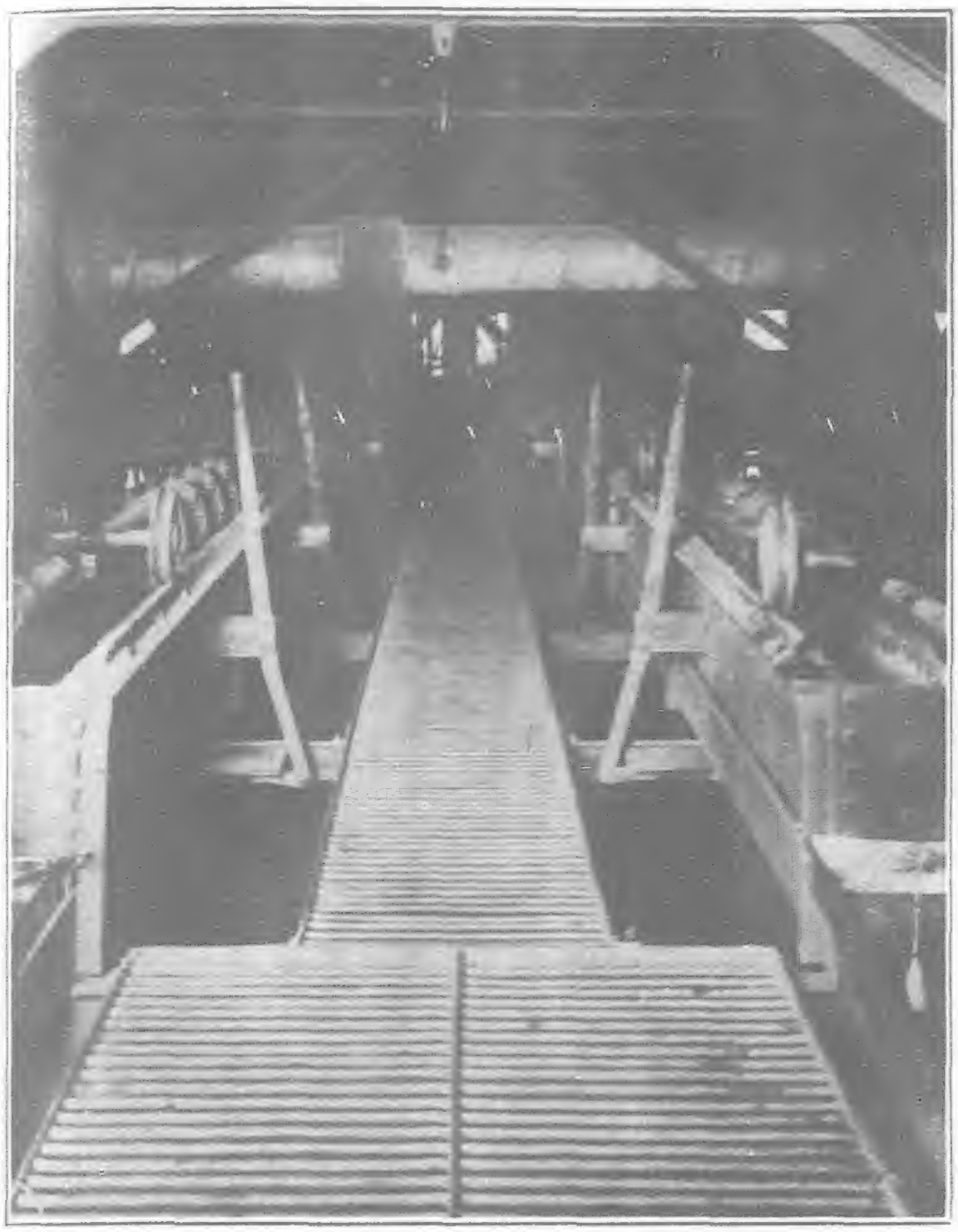
Items : Authorized capital Y.114,300 1913, Y.365,200 1918 ;

Items : Paid-up capital Y.63,460 1913, Y.116,449 1918 ;

Items : No. of work men Y80,762. 1913, Y.95,227 1918, F.162,724 1920 ;

Items : Annual production Y.97,200 1913, Y.816,300 1918, Y.605,290 1920 ;

According to investigations made by the Department of Agriculture and Commerce, and published by the Department of Commerce in July, 1925, (The Department of Agriculture and Commerce were divided into the Department of Agriculture and Afforestation the Department of Commerce and Industry, a short time previous to the publication), there were 3,744 machinery and machine tool producing workshops in Japan at the end of 1923. The number of employees reached 260,394, including 11,807 technicians. Details follow :

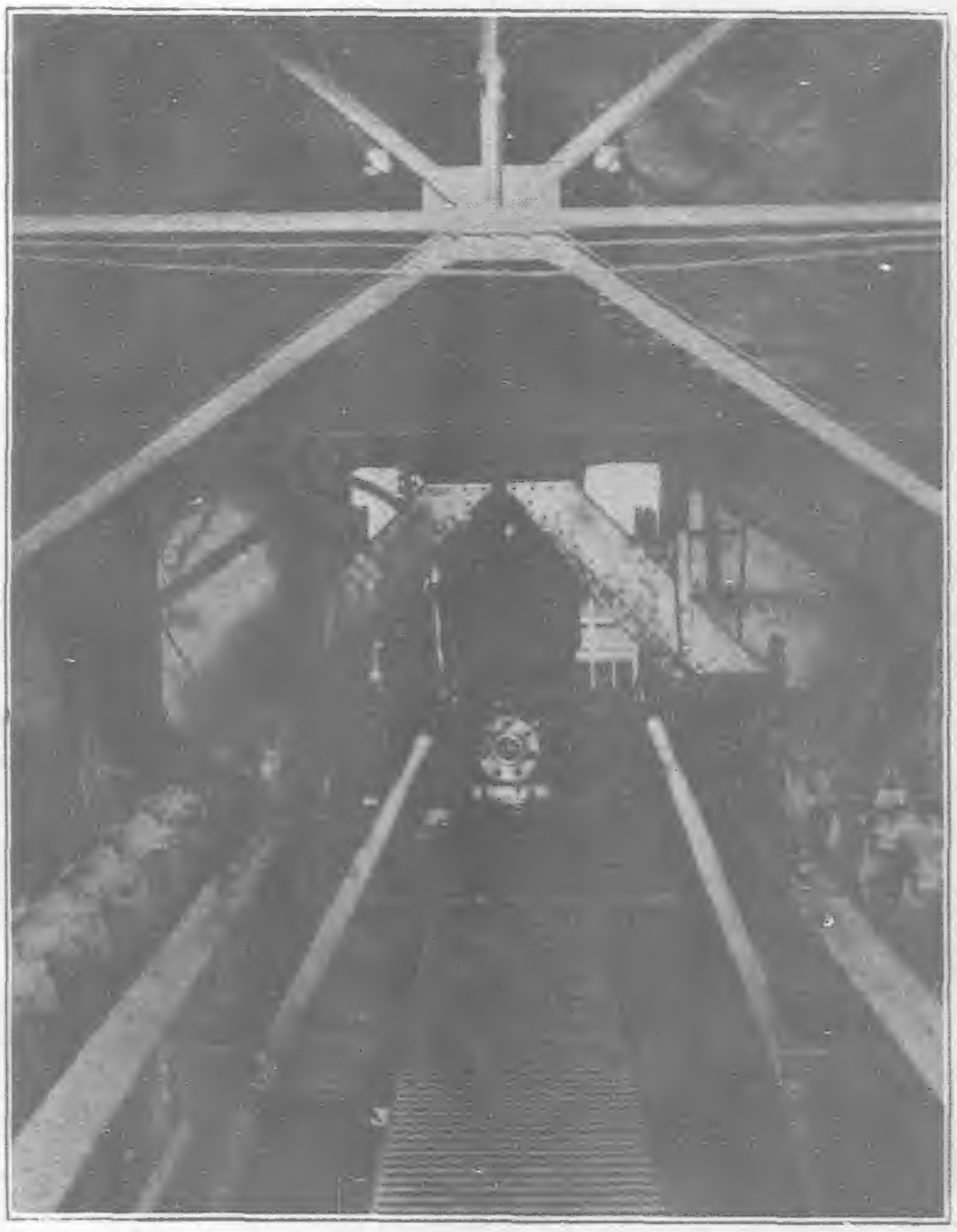


Happy's coal conveyer made by the Japan Elevator Mfg. Co., for the Godo Cotton Spinning Co., Osaka.

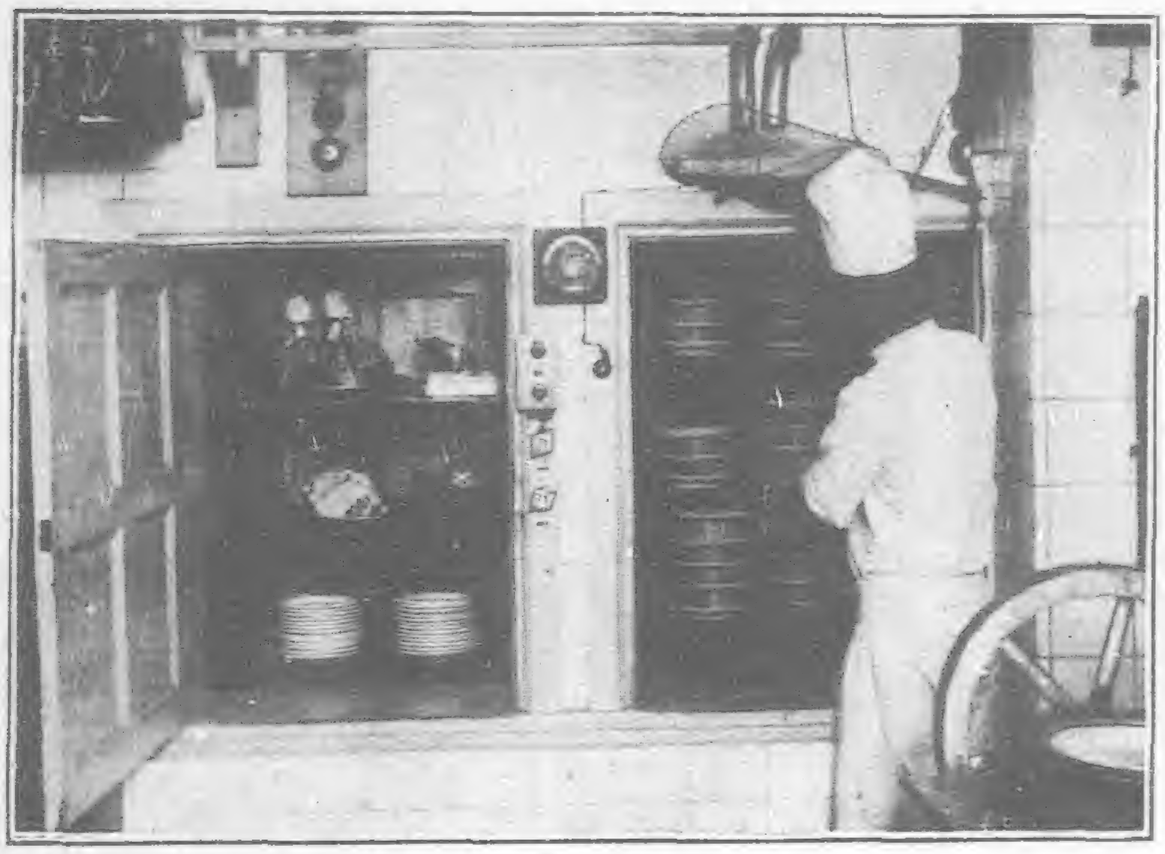
	Workshops	Aggregate total of employees	Technicians	Operatives	Clerks
Boilers, gas producing machinery mfg. industry ...	74	1,585	64	1,396	84
Motor mfg. industry	256	7,192	472	6,121	440
Electric machinery and supplies producing industry ...	343	29,788	2,397	23,876	1,873
Agricultural, civil engineering, and building machinery mfg. industry	169	2,308	74	2,028	165
Mining machinery mfg. industry	36	1,263	74	1,033	38
Spinning machinery mfg. industry	314	9,242	414	7,965	523
Metalic and woodwork machinery mfg. industry ...	265	4,498	234	3,962	222
Other machinery and machine tool mfg. industry	475	7,834	328	6,850	460
Crane and conveyers mfg. industry	19	1,031	84	855	55
Pump and blowers mfg. industry	82	2,840	147	2,454	178
Clocks and metres mfg. industry	235	7,636	380	6,554	514
Cameras and lenses mfg. industry	47	1,575	83	1,296	68
Musical instruments and talking machines mfg. industry	27	2,943	146	2,614	118
Arms mfg. industry	22	17,909	759	15,715	458
Rolling stocks mfg. industry ...	682	42,442	2,401	35,514	1,707
Shipbuilding industry	278	106,059	3,205	98,446	2,428
Airplanes mfg. industry ...	10	7,734	254	7,151	201
Others	404	6,515	293	5,653	383
Totals	3,744	260,394	11,807	229,475	9,915

The Department of Commerce and Industry has recently published that there were 47,786 factories employing more than five operatives at the end of 1923. This figure included 35,360 factories which were operated by motors. The spinning mills were the largest in number which totalled at 18,014. Next came the foodstuff manufacturing factories, the number of which amounted to 9,502, followed by the machinery and machine tools producing workshops, the number of which reached 3,744, including 3,174 which were operated by motors. The annual production by these 3,774 machinery and machine tools manufacturing workshops reached Y.392,065,000 in 1923, the details of which follow :

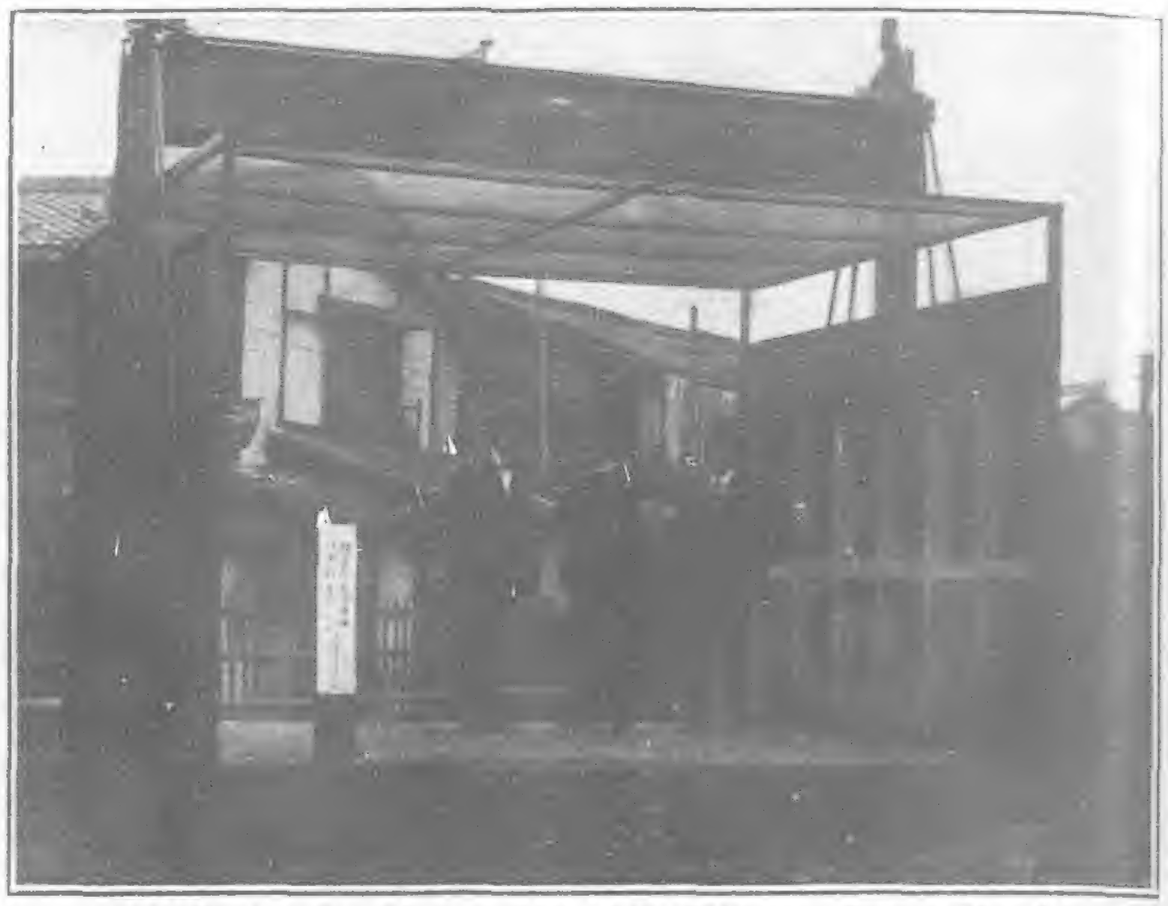
Industry	Annual Production (In Y.1,000)
Boiler mfg.	Y. 1,476
Gas producing machinery mfg.	411
Motors mfg.	15,338
Generators, transformers, electric motors mfg.	14,203
Electric machine tools	43,375
Battery, electric signals mfg.	6,878
Electric bulbs mfg.	16,315
Insulator mfg.	56,390
Agricultural tools mfg.	4,445
Refining machinery mfg.	1,717
Spinning machinery mfg.	16,923
Metalic work machinery mfg.	7,410
Saw-mill equipments mfg.	2,180
Lathe, boring machine, etc., mfg.	1,055
Pottery equipments mfg.	1,015
Paper mfg. machinery mfg.	678
Chemical industrial machinery mfg.	931
Foodstuff mfg. machinery mfg....	2,687
Printing machine mfg.	3,532
Type-founding apparatus mfg.	1,364
Other mechanical industrial apparatus mfg. ...	3,297
Crane mfg.	1,575
Pumps mfg.	6,117
Blowers mfg.	383
Weights and measures mfg.	4,706
Metres mfg.	3,492
Clocks and watches mfg.	5,436
Instruments used in physics and chemical researches	827
Medical instruments	—
Kinetoscope	57



Happy's coal or ash conveyer manufactured by the Japan Elevator Mfg. Co. Installed at the Godo Cotton Spinning Co., Ltd., Osaka.



Electric lifts made by the Japan Elevator Mfg. Co., for the Kitahama Building, Osaka. Speed, 120 feet per minute.



8,000 lb. freight elevator cage (14′×10′) manufactured by the Japan Elevator Mfg. Co., Ltd., and sold to the Mitsubishi Warehouse Company, Kobe.

Industry	Annual Production (In Y.1,000)
Spectacles	1,191
Musical instruments	2,539
Gramophone	1,767
Arms and munitions	3,692
Rolling stocks	54,099
Steamers and other vessels	72,719
Ship's fittings	3,891
Airplanes	3,100
Vaults	1,877
Gas outfits	225
Waterworks outfits	717
Lamps	140
Pulley	1,746
Others	19,939
Total	Y.292,065

NOTE.—The slight difference in the total is due to omission of the figures under Y.1,000.

Japan imports machinery and part thereof mainly from the United States, Britain and Germany. In 1924, Japan imported Y.64,683,000 worth of them from America, Y.35,736,000 from Britain, and Y.16,249,000 from Germany.

Japan's total imports and exports of machinery and parts thereof are as follows :

(In Y.1,000)

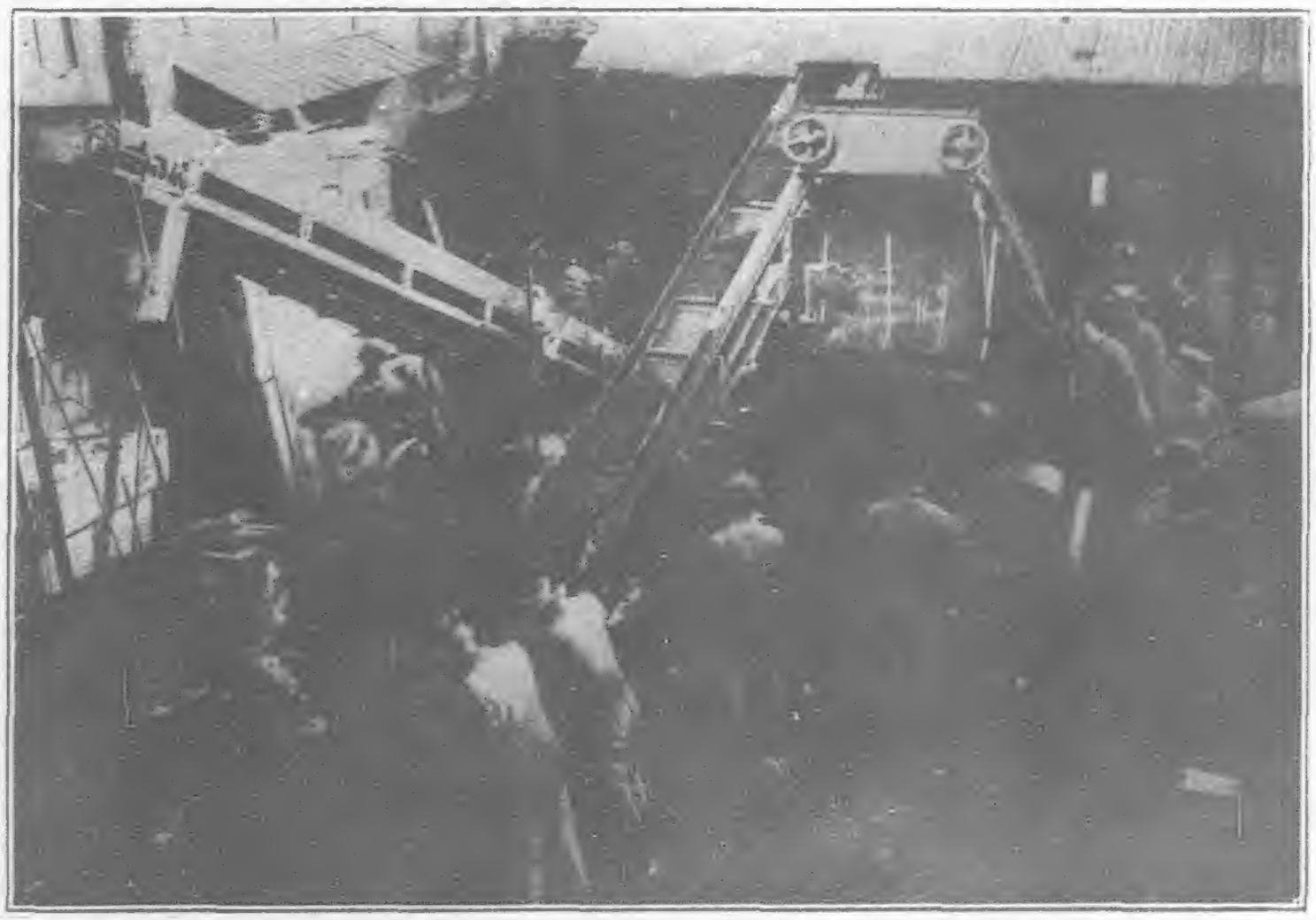
Imports 103,940 1923, 129,523 1924, 46,478 Jan.-June, 1925.

Exports 10,904 1923, 9,632 1924, 4,679 Jan.-June, 1925.

The amount of the imports of machinery and machine tools ranks about the third of Japan's entire imports in value, while that of exports is about the 15th in value, showing that Japan machinery and machine tool manufacturing industry has a great deal to advance. One of the important causes of the inactivity of this industry in Japan is that the production of iron is small. Japan imported Y.199,958,000 worth of iron, inclusive of bar, plate, etc., and this amount is next to raw cotton, the importation of which is the largest in Japan.

The importation of iron ore in 1924 amounted to Y.10,914,000. This illustrates the fact that the iron industry in Japan is not active.

In short, from the view point of trade, Japan's machinery manufacturing industry has not made much progress, and consequently, it does not render much services to Japan's finance.



Portable scoop conveyer undergoing experiment made by the Japan Elevator Mfg. Co., for the Osaka Army Arsenal. Capacity 60 tons of coal per hour.

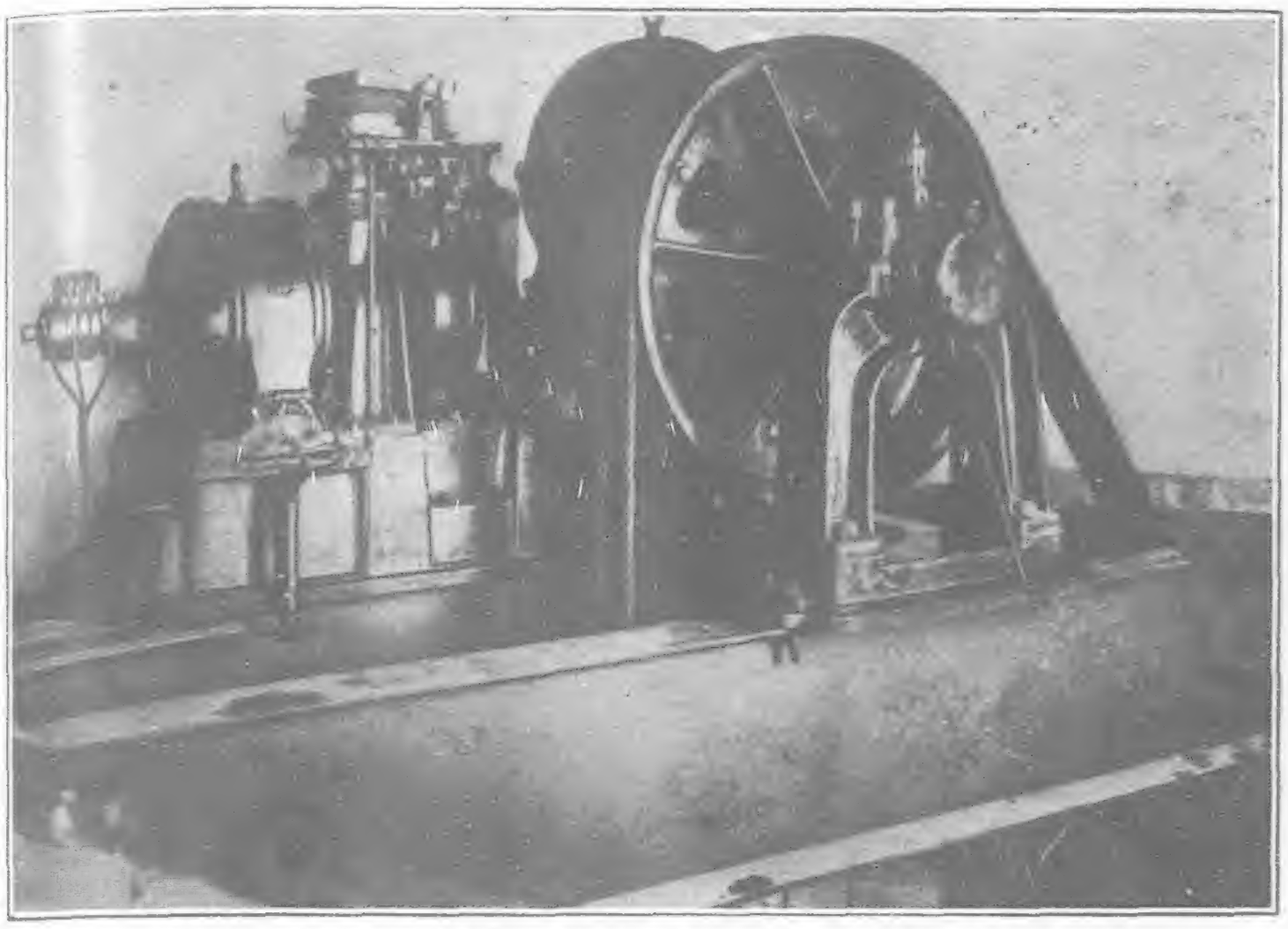
Motor Manufacturing Industry

The motor manufacturing in Japan began in 1908-9. When the European war broke out, motors were being turned out at the Nagasaki and the Kobe works of the Mitsubishi Shipbuilding Yard, the Kawasaki Dockyard, the Hitachi Engineering Works, the Motor Manufacturing Company, Ltd., the Arakawa Workshop, the Dengyosha Engineering Works, and the Ebara Works.

Among the influential makers of motors to-day are the Niigata Iron Works, the Ikegai Iron Works, the Mitsubishi Internal Combustion Engine Mfg. Works, and the Kobe Steel Foundry, in addition to the foregoing workshops.

At present, the annual production of motors reaches Y.15,000,000 in value, although this is a remarkable decrease as compared with 1919 when the annual output exceeded well over Y.50,000,000. But there is no comparison between the motors manufactured to-day and those turned out during the European war boom in points of quality and variety.

The Kawasaki and the Mitsubishi Shipbuilding Yards now turn out water-tube boilers of large capacity, such as used in



Winding engine for electric elevator, manufactured by the Japan Elevator Manufacturing Company, capacity 10,000 lbs., speed, 100 feet per minute, power, 30 h.p.

Two speed passenger elevators made by the Japan Elevator Mfg. Co., for the Osaka Shosen Building (O.S.K.), Osaka.

warships. The Kisha Seizo K.K. (The Rolling Stock Mfg. Company) has recently produced 600 h.p. Tacoma type boiler. So far as vertical and cylinder boilers are concerned, Japan hardly need to import them from foreign countries. The technical progress made in the manufacturing of steam turbin is particularly remarkable; the Mitsubishi Internal Combustion Engine Mfg. Works has recently produced large steam turbines which were directly connected with the 12,000 kilobolt unpare and 8,000 kilobolt unpare generators, and sold them to the Osaka Electric Light Company Ltd., which has been municipalized by the city of Osaka since 1924. Diesel engines are now produced almost at every workshop in Japan.

With all its magnificient progress made by the machinery manufacturing industry, however, it cannot keep pace with the progress of general manufacturing and electric industries. Consequently, steam turbines of high quality, large type hydraulic turbines and belton turbines are still imported from foreign countries, where better machinery is sold at lower prices than in Japan.

The principal drawbacks of Japan's motor manufacturing industry in producing good ones at cheap price are (1) high price of iron materials, and (2) insufficiency of the technical progress. Observers believe, however, that if the technique of making them witnesses more progress, the disadvantage in obtaining the iron materials will be made up. But owing to the general financial depression since the termination of the European war, Japan's motor manufacturing industry has not had the opportunity of making speedy technical progress. In short, the motor manufacturing industry is still in the period of trial at present.

Cable car (funicular railway) speed, 7 miles per hour, steepest grade 1/4, one tram car carries 90 passengers manufactured by the Japan Elevator Mfg. Company, and sold to the Shiki-Ikoma Electric Railway Co., Ltd.

Electric Machinery Mfg. Industry

Most of the manufacturing industries in Japan, which displayed amazing activities during the European war boom, have hardly recovered from the reactional business depression. The electric machinery manufacturing industry, however, has been an exception to the general rule. Moreover, it is becoming more and more promising, favorably influenced by the ever-growing prosperity of the electric industry in this country.

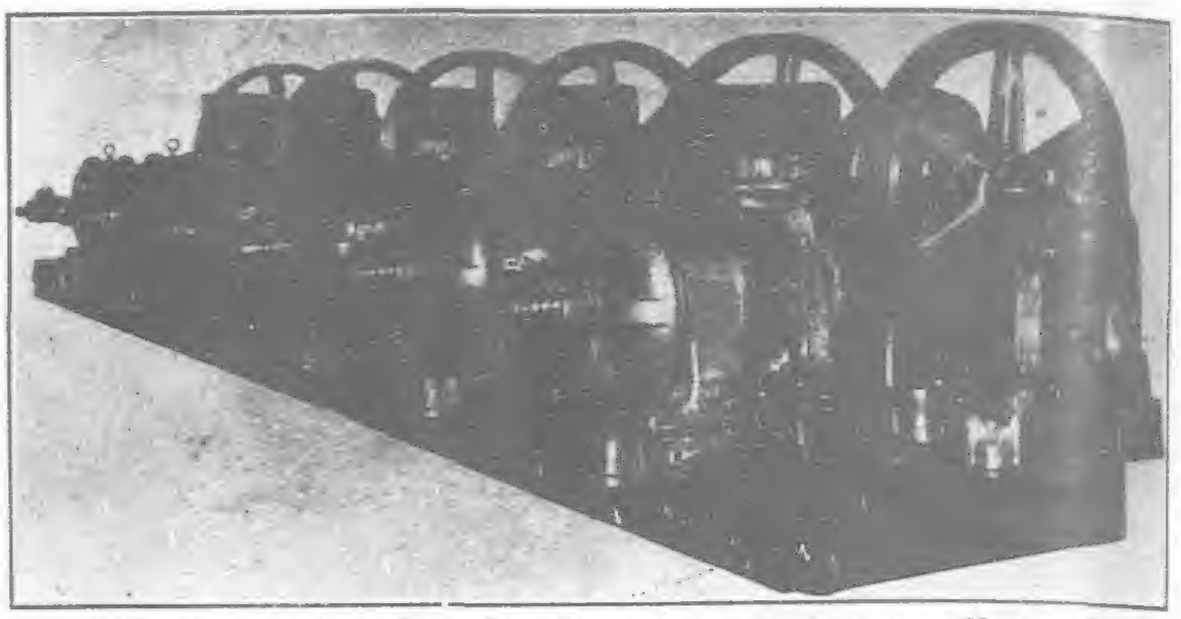
It was in about 1891-2 when the Shibaura Works began manufacturing electric machinery for the first time in Japan. In 1896, Tokyo Denki K.K. (The Tokyo Electric Company), which is the first maker of electric bulbs, was established. Three years later, Nihon Denki K.K. (the Japan Electric Company) was organized.

The first phase of development of the electric machinery manufacturing industry was made during the Russo-Japanese war boom, when numerous electric companies were established.

The Osaka Electric Bulb Mfg. Company and the Osaka Electric Machinery Mfg. Company were established in 1911. In 1912, the Oki Electric Company was organized.

At the end of 1914, there were 26 factories which produced electric machinery, and the authorized capital of these totalled at Y.14,510,000. The number of employees reached 5,258. The annual production of the electric machinery was valued at Y.8,510,000. During the European war, Japan needed a great deal of electric machinery, but the importation of them was difficult, eventually resulting in the unprecedented activity of electric machinery manufacturing

Electric conveyer of raw cotton, capacity, 300 packages per hour, weight of a package is from 500 to 700 lbs. made by the Japan Elevator Mfg. Co., sold to the Mitsubishi Warehouse Co.



Winding engines for electric passenger elevators all six of them were made by the Japan Elevator Mfg. Company for the Department of Communications, capacity, 2,000 lbs. speed 180 feet per minute

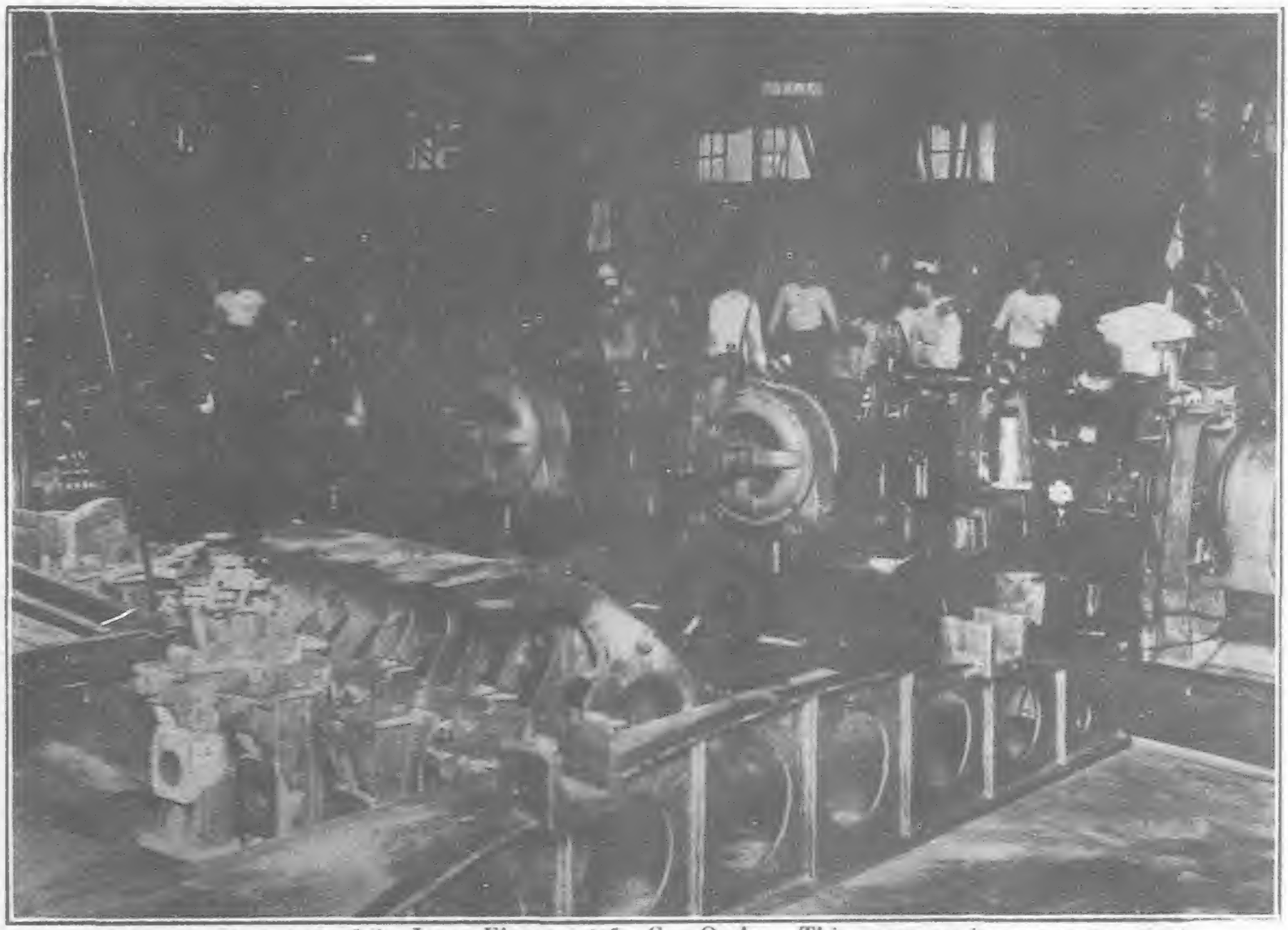
industry. This gave rise to organization of more electric companies. Among these were the Japan Electric Battery Company, the Yasukawa Electric Machinery Mfg. Workshop, the Meidensha Engineering Works (all of these established in 1917), the Kawakita Electric Company, the Yuasa Dry Cell Mfg. Company, the Toyo Electric Machinery Company (established in 1918), and the Kobe Works of the Mitsubishi Electric Company which was founded in 1919.

In 1920, the number of factories manufacturing electric machinery increased to about 120, and 20,000 kilobolt unpare generators were produced. At present, Japan made electric motors and generators are widely used in steel and copper rolling, at spinning and weaving mills, in chemical industry, in running tram-cars and heavy cranes. Japan can be independent from foreign supply so far as electric fans and telephone and telegraphic apparatus Moreover, the Japanese producers are exporting a large quantity of electric machinery to China, Kuantung Province, India, Australia and Asiatic Russia.

As for generators and electric motors of large capacity, however. Japan cannot advantageously compete with foreign producers, The electric heaters, the use of which is becoming a fashion of the day in Japan, and some other special electric apparatus are still imported into Japan from European and American countries in large lots.

One characteristic of Japan's electric machinery manufacturing industry is that prosperous electric firms are running business in cooperation with influential foreign companies, e.g., the Shibaura Engineering Works co-operates with the General Electric Company. The Osaka Electric Machinery Manufacturing Company and the Kawakita Electric Company, which have no special relations with prominent foreign electric companies, are not showing praise worthy business results.

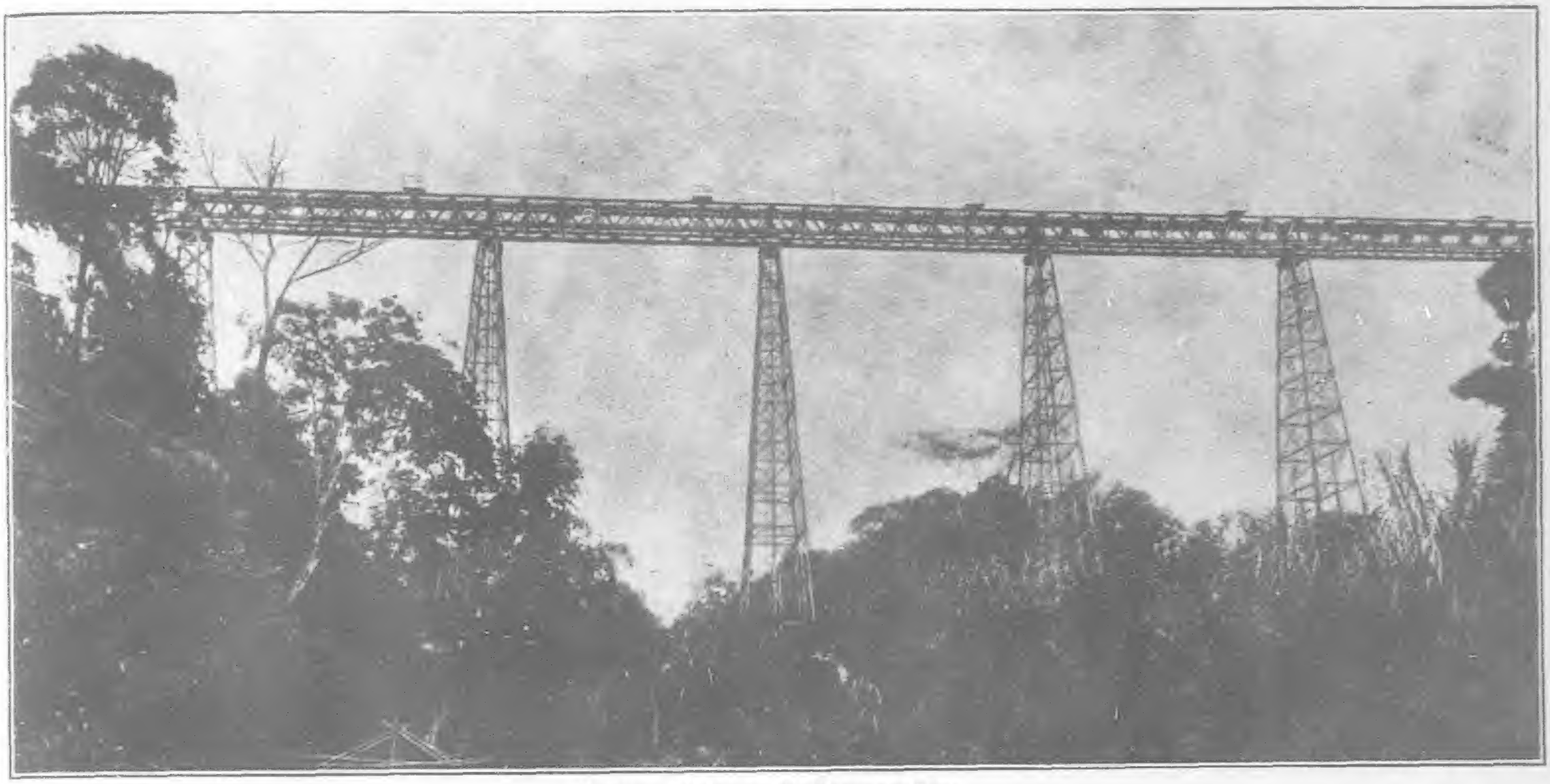
The one weakness of the electric machinery manufacturing industry in Japan is the high price of raw materials. But judging by the facts that it is showing a rapid technical progress and that the electric light and power supply industry is continuously growing prosperous, the electric machinery manufacturing industry in Japan is one of the most promising industries in Japan.



Assembly workshop of the Japan Elevator Mfg. Co., Osaka. This company is one of the most influential elevator and conveyer manufacturers in Japan. It employs 150 workman, who work under personal instruction of Dr. Kakutaro Hori, Managing Director of the Company.

Slaughter Houses, Tientsin

The slaughter houses at Tientsin, have just been enlarged by the addition of a meat cooling and freezing plant supplied by Sulzer Brothers, Winterthur. An innovation of this kind of installation is the facility with which the cold air supply can be regulated, thus allowing of very different temperatures being attained in the various cold rooms. In fact, it is not only the amount of cold air, but also its refrigerating effect which is regulated by adjusting the current of air in accordance with the amount of cold required and the temperature of the rooms. This arrangement eliminates the necessity of adjusting a number of regulating valves, always a very difficult operation to execute properly, and only requires the adjustment of two simple valves. Separate cooling rooms are provided for beef and pork, as well as separate cold rooms and freezing rooms. An overhead rail allows the carcases to be easily and quickly transferred from one locality to another. The cold required for cooling and freezing is produced by two Sulzer compressors, each of which is capable of producing two-thirds of the total amount. Each section has not only its own air cooler but also its particular set of machines and apparatus.



Railway Bridge on the Preanger Line

The State Railways of the Netherlands East Indies

By "Djembatan"

EXACTLY 100 years ago the world was startled by the news that a certain George Stephenson had invented a steam engine which could run on rails and draw a load of passengers and goods at a speed of from 10 to 15 miles per hour. When we read of the first journey of the "Rocket," as this locomotive was called, and learn that it was only allowed to be used on condition that it was preceded by a man on horseback carrying a red flag, and then gaze around us at the modern rolling stock in use on the railroads of the present day, we can hardly believe that such a development could have taken place in this comparatively short time, and yet if we compare the present transport facilities in these islands, and especially those of Java, with the conditions prevailing here 75 years ago the contrast is even more remarkable.

It is a co-incidence that where this year the centenary of the invention of the steam locomotive has been celebrated in England the State Railways of Java have also in April last registered their fiftieth anniversary: it will thus be seen that fifty years elapsed after the introduction of the railway before steps were taken to provide Java with an iron road, so that those responsible for its rapid development undoubtedly deserve the highest praise for their efforts which have been crowned with such remarkable success. Let us take a glimpse at the transport conditions prevailing here seventy five years ago, when the railway was still in its infancy, even in the European countries.

It is hard to imagine a country such as Java, which owes its greatness to its agricultural industry, without railways to transport the produce from the various estates in the interior to the ports of shipment. Practically all the produce from the estates, which were then to a large extent in the hands of the government, had to be brought to the coast by means of horse and bullock carts so that it does not require much imagination to realise that any progress in the economical development of the island was out of the question. The result was that produce, stored in the warehouses inland, was allowed to rot, whilst ships were forced to wait in harbour, sometimes as long as six months, before they could leave with a full cargo. We who live in the twentieth century find it difficult to realise that such conditions of chaos existed only a comparatively short time ago.

Principal Workshops between Weltevreden and Meester Cornelis

A few leading men of the time suggested the introduction of the

The Station at Weltevreden opened this year

railway as a solution of the problem, but the majority of the government officials were against this proposition, even though the railway had already proved its worth in other countries : they preferred to endeavour to improve matters by the importation of mules, camels and elephants, but these died off like flies and in the meantime the freights rose by leaps and bounds.

It was not until the year 1875 that a law was passed in Holland permitting the government of the Indies to commence laying a railway line to be operated by the State and it can be imagined with what enthusiasm this news was received in the Colony, even though this sanction was only in respect of a short traject between Sourabaya and Pasoeroean and Malang. The 6th of April, 1875 was regarded as a turning point in the economical history of the Netherlands East Indies and it will be seen that the Colonial Government was not slow to take advantage of their newly acquired powers. This line was completed on the 20th of July 1879, a gauge of 1,067 M. being used.

It must, however, not be forgotten that previous to this private companies had succeeded in obtaining concessions for the exploitation of railways, of whom the principal was the Netherlands Indian Railway Company, which still exists to-day. This company had to cope with almost unsurmountable financial difficulties but, with the help of the Government, it succeeded, in completing the whole of the railway net contemplated. It is impossible within the scope of this article to give a detailed account of the progress of the State Railways during the first years of their existance, but for the sake of comparison it may be mentioned that in 1898, thus 23 years after the introduction of the railway into Java, more than 8,000,000 passengers were carried on the State lines alone, as a result of which more than 3,500,000 guilders were received from the passenger traffic, whilst the transport of goods brought in a further 6,000,000 guilders. At this date communication had already been established between Batavia and Sourabaya via Buitenzorg, Bandoeng, Tjibatoe, Maos, Djokja, Solo, Madioen and Kertosono. Only two small sections of this line were then still in the hands of private companies namely the traject Batavia-Buitenzorg and Djokja-Solo.

In addition to this other private lines were being exploited between Djokja and Malang, Maos and Bandjarnegara and Cheribon-Semarang-Joana with branch lines to Blora, Willem I and Solo. Further the Goverment had by this time completed a whole network of railways in the Residencies of Besoeki, Pasoeroen and Kediri in East Java.

Let us now turn our attention to the progress which had been made in the Outer Possessions. In Sumatra the first line to be constructed was from Olee Lheue to Kotaradja, a distance of 4 k.m., which was used exclusively for strategical purposes, and opened for traffic in 1876. It was not until 1883 that a private company, the Deli Railway Company succeeded in obtaining a concession for the exploitation of several lines and after this the development of the iron road on this island was rapid. In 1894 the line Emmahaven-Sawa Loentoe was opened chiefly for the transport of the coal obtained from the Sawah Loentoe mines, to the coast, whilst in 1895 a further 23 k.m., from Fort de Kock to Pajacombi was added to this traject.

Sumatra was at this period the only island in the Outer Possessions which could boast of an iron road and even at the present day the only other island on which a railway is being exploited is Celebes, where the Celebes Steam Tram, which also falls under the State Railways, maintains a service from Takalar to Macassar. Owing to the need for strict economy the extension of this line to Maros, Tanette, Pare-Pare and Singkong has had to be postioned.

At the present day the State Railways with 2857 k.l.c. and 12 private companies with 2557 k.m. of railway provide a network of communications throughout Java which have in no small degree assisted in the economical development of the island and in obtaining for her the position of an important producing country.

It must be mentioned here that the railways of the Netherlands East Indies divided into two classes i.e. the railroad proper and the so-called steam tram. The latter must not, however, be confused with the street tram as it is known in Europe and elsewhere where the word " tram " is used in connection with steam or electrically driven conveyances for local traffic in towns, but in Java, Sumatra and Celebes the steam tram is to all intents and purposes a railway communication between towns, with this difference that certain regulations have to be observed with regard to speed. The principal reason for the introduction of this class of communication was one of economy as owing to the reduced speed at which these trams travel, the laws providing for the protection of the line and especially level-crossings are less severe and consequently the costs of expoitation are considerable less than those of a railway which is compelled to provide efficient methods for the protection of life and property. All the private companies, with the exception of the Netherlands Indian Railway Company, belong to this category and even this company owns 652 l.c. of tramway out of a total mileage of 863 k.m. in operation. In Sumatra, the Government operates at the present time the following lines : West Coast 284 k.l.c. Lampong Line (South Coast) 110 k.m. Palembang Line (South Coast) 284 k.m. and Acheen 511 k.m., in addition to which the Deli Railway Company operates over 473 k.m. of line on the East Coast, so that this island, which according to all reports, has a wonderful future in front of it, is abundantly provided with means of communication.

If we look at the map of Java we shall see that the island is extremely mountainous, especially in the Western and Eastern districts and for this reason we must appreciate even more the enterprise and skill of the Dutch engineers who have, notwithstanding difficulties and obstacles, succeeded in providing the island with a network of railways which as far as extensiveness is concerned, is second to none in this part of the Far East.

Those who have had the good fortune to travel on the State Railways through the Preanger Regencies in West Java can realise

Roof of the Tandjong Priok Station

to some small extent the natural difficulties with which the pioneers of the iron road have had to contend, but let us not forget that Dutch engineers are world famous and it is they who have made the seemingly impossible possible. When we pass over the bridges, mighty steel structures spanning gorges hundreds of feet deep, where far below the mountain torrents are racing in their mad rush to the sea, we cannot but fail to offer a silent word of thanks and praise to those who have brought this wonderful region of "The Granary of the East" within the reach of all. The mere fact that at one spot on the line through the Preanger, five railway bridges can be seen from the train speaks volumes for the obstacles which have been overcome by sheer endurance and skill—a veritable victory of Science over Nature. It has often been said that the railways are the arteries of a country and Java is no exception, for without her railways her trade would collapse : how could the numerous sugar, rubber and other estates transport their produce to the coast for shipment and in return receive the machinery and supplies necessary for their factories, if it were not for the extensive system of railway communications which she possesses.

It is certainly to be regretted that during the last few years the development of the railways of the Netherlands East Indies has been retarded owing to the need for drastic economy : Many new schemes for the extension of the existing lines have had to be postponed and it is only upon the return of better conditions that the Government will be able to carry out the programme which it has under contemplation. Lines on the islands which have so far no rail communications are also under consideration and it is certain that as soon as the financial situation improves steps will be taken to extend the already extensive railway net both in Java and the islands of the Outer Possessions.

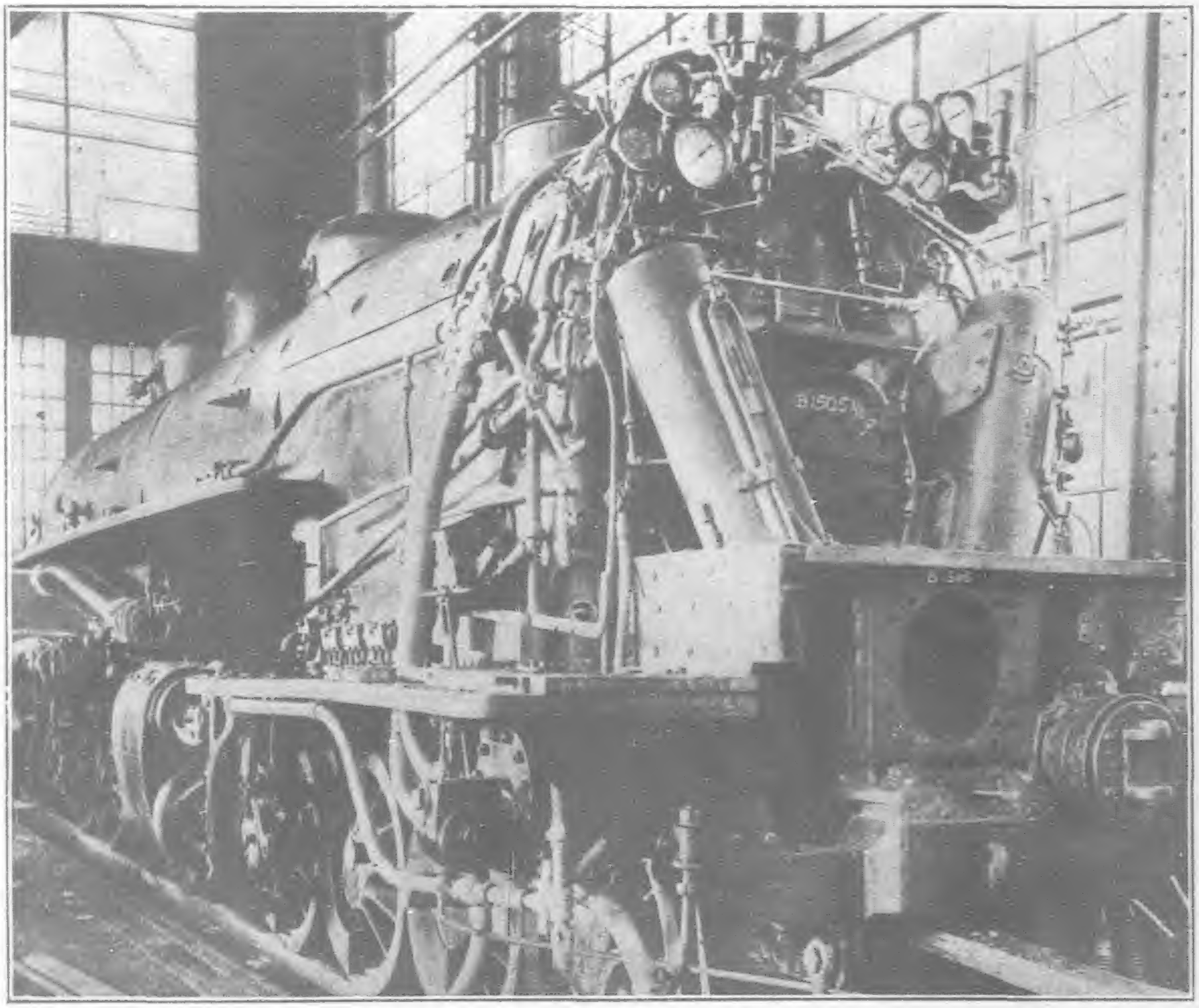
In giving a review such as this it is also of importance to draw attention to matters which compare less favourably with those of institutions similar to that under discussion and we will now endeavour to draw a comparison between the lines and services of the State Railways of Java and those of the neighboring countries such as the Federated Malay States and Siam. It should of course be understood that the following criticism is offered in the best spirits, and only for the reason that we are convinced that our criticism bears a decidedly constructive character. As already mentioned the State Railways are second to none as regards extensiveness in this part of the world but as regards service there are a few points in which they compare less favourably with the railway systems of their neighbors.

The first and foremost question is one of night trains. In Java and the islands of the Outer Possessions no night trains are run and although this question has from time to time been discussed in the local press no steps have been taken to introduce this manner of travelling, which on certain routes would undoubtedly be welcomed with open arms. Many reasons have been preferred for the non-adoption of night trains none of which however seem to present unsurmountable difficulties, for what is possible in the Federated Malay States is surely also possible in Java. Let us review the objections which have been raised and it will then be seen that they appear much more formidable on paper than they really are. In the first place it is suggested that native drivers are not to be trusted upon night duty as there is always the possibility of their falling asleep on the footplate ! Thus endangering the safety of the passengers but this is in my humble opinion a very weak argument for why should a native driver in Java be more susceptible to such irregularities than an Indian or Malay driver in the Federated Malay States or a Siamese driver in Siam ?

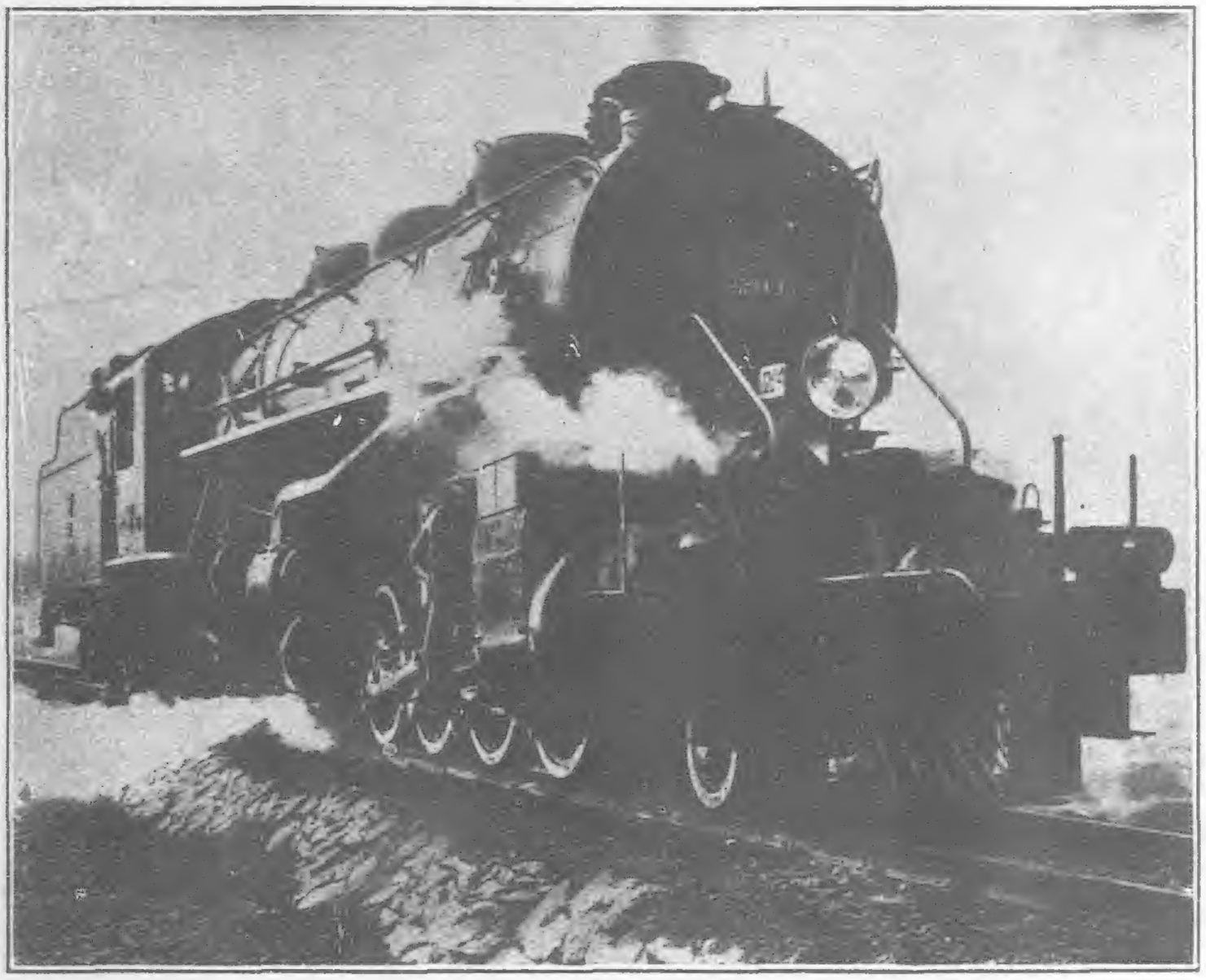
The express trains between Penang and Kuala Lumpur and Singapore are often driven by Indian drivers and such difficulties as suggested above are apparently not met with there. A second reason is one of expenditure : it is declared that the arrangements which would have to be made for the running of night trains such as additional line watchers, signal and station staff, would increase the costs of exploitation to such an extent as to make their running unprofitable. Here again the obvious answer to this argument is that if it is possible in the F.M.S. why not in Java ? It speaks for itself that an estimate would have to be made of the extra expenses involved and these taken into account in the fixing of the fares. A further argument against their adoption is that of landslides which would probably not be observed owing to the darkness with the result that a train would run the risk of dashing to destruction. Whilst there is something to be said in favour of this argument, as landslides are more frequent in this country than in the Federated Malay States owing to the volcanic nature of the soil, it must not be forgotten that several of the express trains which are running every day frequently finish the latter part of their jurney in darkness so that there would appear to be just as much risk then as when running the whole night through and in any case precautions could be taken where by this risk would be reduced to a minimum.

No, it seems to us that the real reason for their non-adoption lies in quite another direction. The Hollander is by nature adverse to night travelling and looks upon this manner of getting about as an abnormality and even in Holland, in the centre of the busy Continental traffic, night trains, with the exception of the International trains are unknown.

This is a peculiarity of the Dutchman and just as sons take after their fathers, so do colonies take after their mother countries. There is little doubt, however, that once this prejudice was overcome he would soon realise the



Automatic 1 D and D Locomotive



1 D and D Mountain Railway Mallet Locomotive

advantages of travelling by night and would become just as great an agitator for the adoption of this great boon to the business man, as his neighbors in the Federated Malay States. Let us for a moment review the advantages which a night service would bring to Java. In the first place the long discussed one-day-service between Batavia and Sourabaya and vice versa would be solved. The business man to whom in this country "time is money," just as much as in any other land, would be able to board the night express in Batavia at say 6 p.m. and arrive at his destination, Sourabaya, at noon the following day a saving on the present manner of travelling of 12 hours of daylight! Comfortable "sleepers" could be provided so that the drawback of the loss of a night's sleep would be done away with whilst at the same time the inconvenience of having to stay overnight in a hotel, as is now the case, would be a thing of the past. The distance could be covered at a comfortable speed where by a considerable saving in running costs could be made which in turn would reduce the extra expenditure already mentioned, and one of the real inconveniences attached to travelling in Java i.e. the early departure of the trains, would be obviated—a no small blessing. This is a matter of severe criticism on the part of both residents and visitors and one can quite imagine the indignation of a tourist on hearing that his train is timed to depart at the ungodly hour of 5.30 a.m. It is only quite recently that a correspondent of the Straits Times christened Java "The Land of Early Trains," a title rather apt to scare intending visitors! It would hardly be correct to say that travelling by train in a tropical country is a pleasure, far from it, for although everything has been done to make the journey as comfortable as possible the fact remains that travelling in a tropical climate in the heat of the day has many disadvantages. Heat, dust, sparks and cinders all go towards marring the delights of a railway journey but if the same journey was made in the cool of the night the disadvantages would be reduced to the minimum. Yes, night trains would without a doubt, be a boon to the travelling public in Java but one wonders how long it will be before the powers that be realise the advantages to be gained by their introduction.

Another point in which the Java Railways compare less favourably with those of the Federated Malay States is the matter of carriages. Those who have travelled on the long distance lines in Java know only too well the inconvenience caused by the excessive heat and the system on which the carriages are built does not tend to provide the maximum of comfort so desirable when one is compelled to spend the whole day in the train, and in this connection the authorities would do well to study the construction of the F.M.S. Railways which, instead of being divided into compartments as is the case with the express trains in Java, consist of one long carriage without any divisions, so that there is always a current of air circulating through the vehicle with the result that travelling there is much cooler and thus more comfortable.

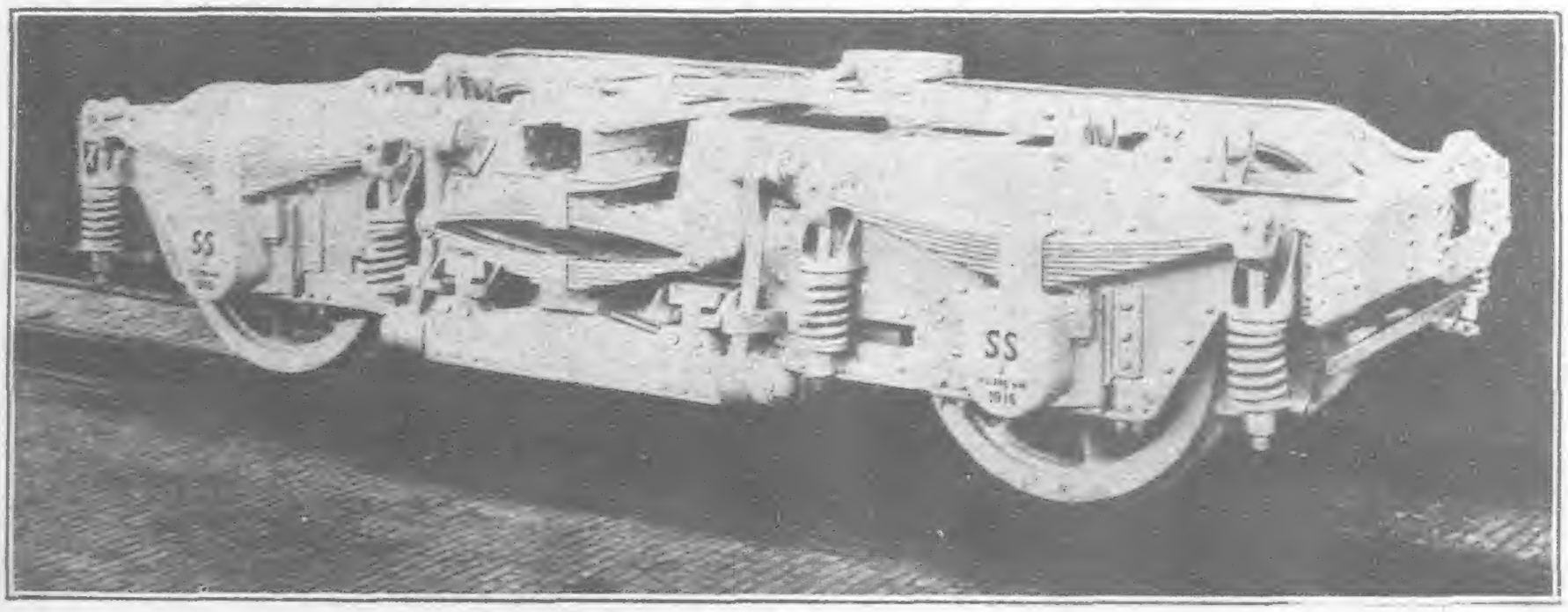
The question of dress when travelling by train in the tropics is also an important item but as this does not fall within the scope of this article I will confine myself to the remark that if travellers in Java, and I refer more particularly to the Dutch residents, were to dress more freely and less conventionally they would soon come to the conclusion that after all the maxim "comfort first" can be followed without any loss to their dignity.

The system of being able to purchase tickets for the intended journey in the office of the hotel in which one is staying is also a great convenience, doing away with the necessity of having to rush to the booking office at the last moment and the possibility of losing one's train.

These are a few of the points of difference which compare less favourably—for the rest Java's Railways can hold their own with those of other countries in the neighborhood and should these suggestions ever be adopted than Java will be able to boast of a railway service which is second to none in all respects.

We have now gone at considerable length to point out the shortcomings of the railways in this island, but let us now in all fairness make mention of a matter in which they are far ahead of their neighbours over the water—the electrification of the system. The jubilee of the State Railways marked an eventful epoch in their history for it was on this day that the electrified section of the line Tandjong Priok—Meester Cornelis was brought into operation. It is hardly necessary to mention that this was a redletter day, for it brought with it not only a vast improvement in the present communications but it was the first milestone on the road to much bigger things, i.e. the electrification of the whole railway net in Java.

The question of electrifying the existing lines has been under consideration for several years but the financial circumstances would not allow of a start being made until quite recently and even now the change over from steam to electricity has to



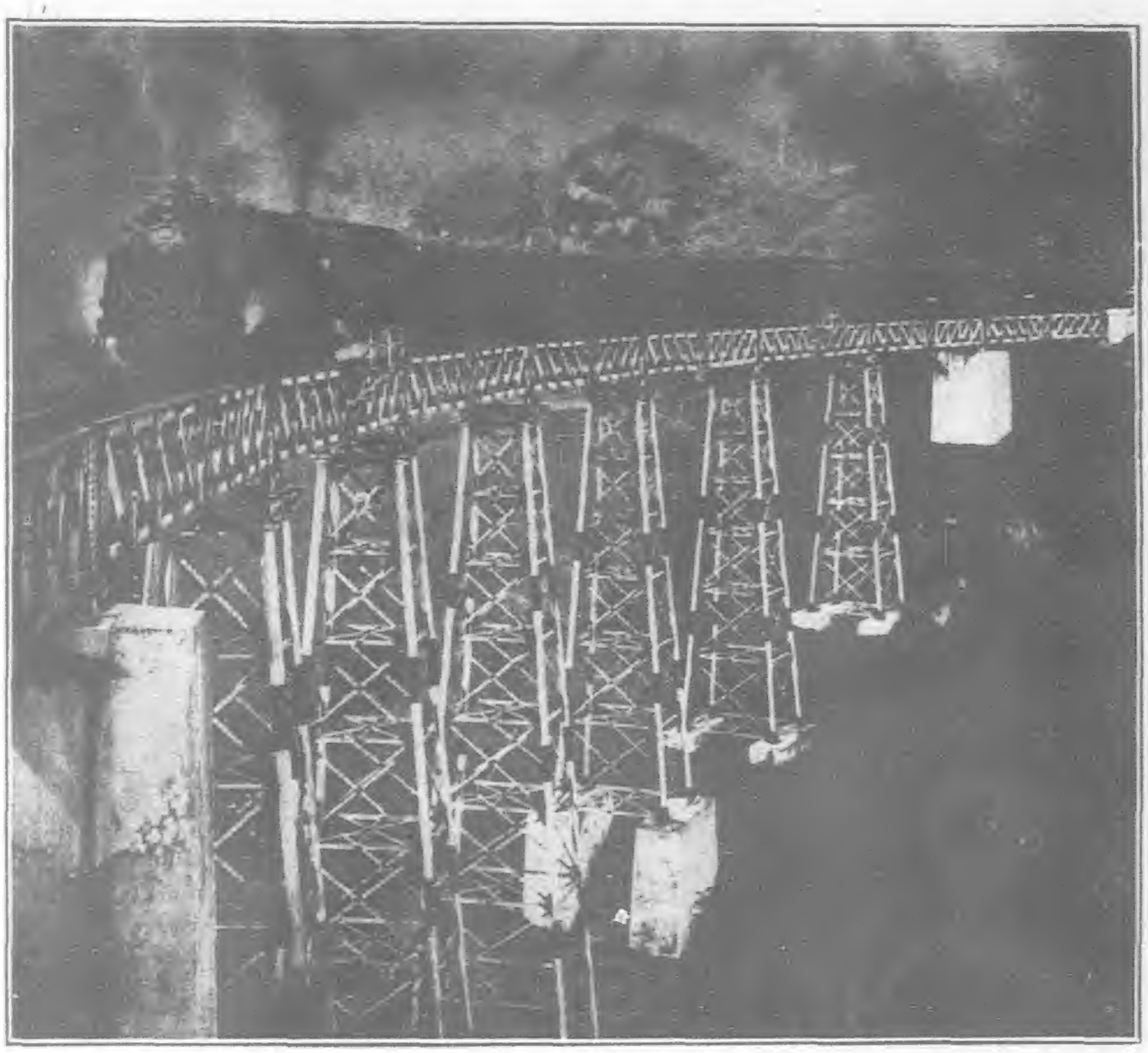
Coach Truck with springs outside the frame

be made by degrees, the opening of the above mentioned line marking the commencement of these operations. It was only natural that, with the introduction of electric railways in Europe and America, the suggestion of electrifying the system in Java should be made and this suggestion was given serious consideration by those in authority with the ultimate result mentioned above.

What a revolution in so short a period. From bullock carts to magnificent electric trains and that in fifty years! It was the success of the Chicago-Milwaukee Railway, the first railway to be electrified on a large scale which decided the question of the electrification of the Java railways: this and the electrification of main lines in other countries proved that electric trains could be run even more economically than steam trains especially in mountainous country. However, owing to the war the plans had to be postponed for owing to the fact that Java produces no coal it was realized that in time of war an enemy country could cut off these supplies necessary for the generation of electricity and with one stroke dislocate the whole railway traffic.

In a report published in 1917 it was shown how this could be avoided. Why should not the enormous water in Java, producing millions of horsepower per day, be harnessed and used for the generation of current for the railways and eventually for the lighting of the towns? The proposition was to build two water-power stations and to bring the current generated there by means of high tension cable to Tandjong Priok: to electrify the lines in Batavia, the line to Buitenzorg and eventually to Soekaboemi and also the main line as far as Tjikampek. These propositions, logical and economical as they were, were welcomed in all circles and it was not long before they were accepted by the Minister for the Colonies and Parliament in Holland. The building of the water-power station was commenced in 1919, one being erected at Tjitatih and the other at Tjianten, now known as the Oebroeg and Kratjak Stations, but owing to the unfavourable conditions which set in in 1921 it was found necessary to curtail the original program considerably and the work on the Kratjak Station was suspended whilst the electrification of the system was confined to the net in and around Batavia. The work on the line to Buitenzorg has had to be postoned until better times but the local lines in Batavia are nearing completion whilst, as already mentioned the line Tandjong Priok-Meester Cornelis has been in operation since April this year.

That the introduction of the electric system has proved a success is shown by the manner in which the new trains are patronised both by Europeans and natives who are only too anxious to take advantage of the faster and more frequent service provided. Let us hope that communication by electric train between Tandjong Priok and Weltevreden will soon be established whereby the present idiotic necessity of having to travel from Tandjong Priok to Weltevreden by motor car (owing to the infrequent train service) will be obviated. Result—increased revenue for the railways and a no small saving to the public. Java is the pioneer of the electric railway in South East Asia—let us hope that she will always hold the lead which she has obtained.



Railway Bridge on the Preanger Line near Melangbong

An article such as this would be incomplete if the financial results were not reviewed and although this may prove to be some what "dry" to some readers it is in any case interesting to note the development of the Java Railways from a financial point of view.

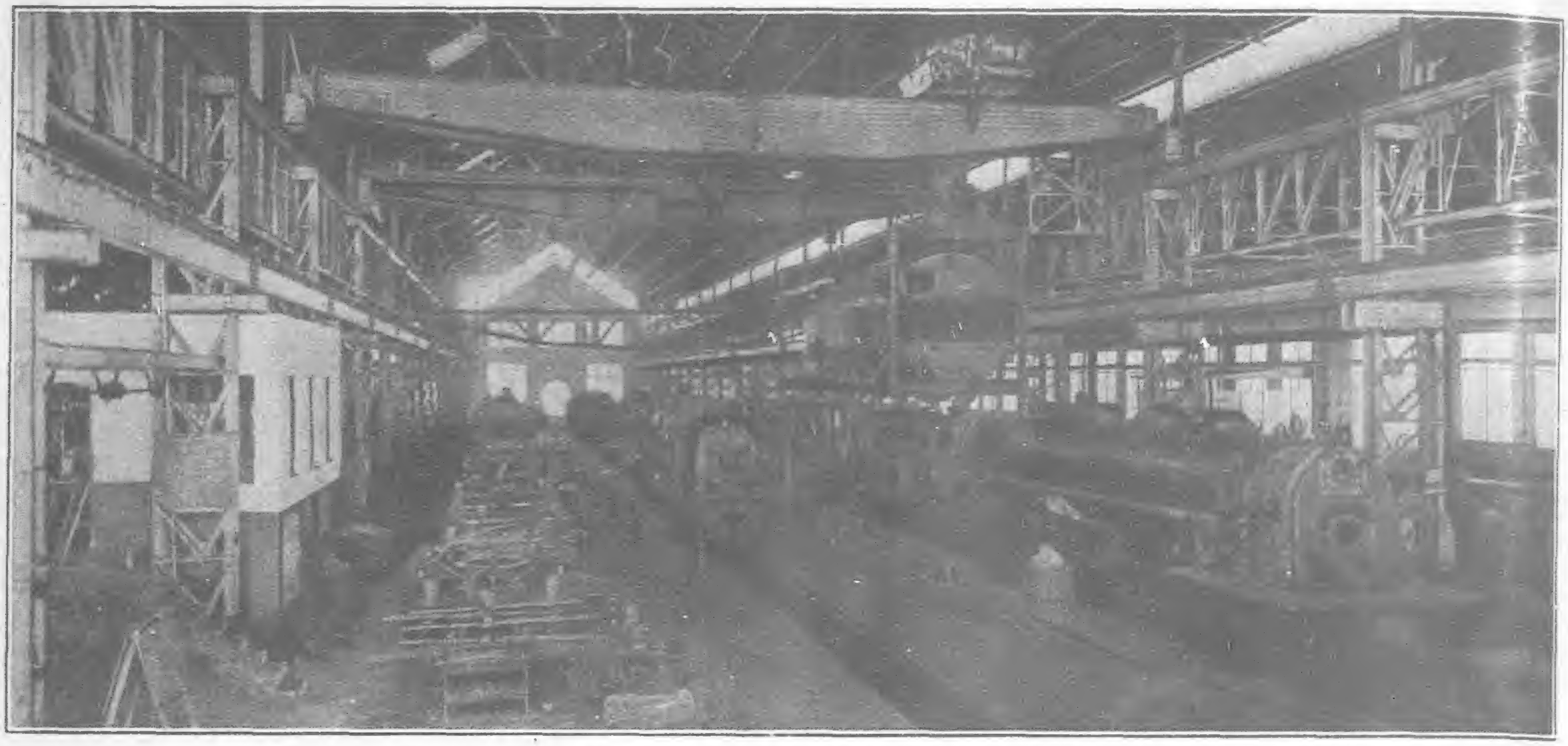
It has never been the intention of the East Indian Government to turn the State Railways into a gold mine for their own benefit, the sole object of their having taken the initiative, at the time when private capital was not forthcoming, being the solution of the urgent question of transport on the island. Thus the first steps were taken solely in the interests of the welfare of the country and without any thoughts as to possible profit, and on the whole the results are not disappointing. If we examine the results of the various lines separately we shall see that whilst some show a substantial profit others are working at a loss: among the latter may be mentioned the Acheen tram, the Palembang Line and the Lampong Line in Sumatra.

The gross receipts whow a gradual increase from the date of the introduction of the railways until 1922 when a considerable decrease was felt. On the other hand the costs of exploitation increased by leaps and bounds during and after the war years as a result of the rise in the prices of materials and consequently the margin available for renewals, maintenance repairs and depreciation became considerably reduced. The highest receipts registered since the inovation of the railway were registered in 1921 when they amounted to more than 80,000,000 guilders but in this year the costs of exploitation were also the highest ever experienced. The highest balance of gross receipts over exploitations costs was in 1924 when a balance of 23,452,006 guilders was available of which approximately 4,000,000 guilders were carried forward to the repairs, maintenance and depreciations accounts.

If the results of the profitable and the non-profitable lines are considered as a whole it will be seen that the rate of interest earned, calculated over the whole capital involved, has varied in the last fifty years between 0.8 per cent the lowest figure being registered in 1922 and the highest in 1924. If we consider only those lines which are operated at a profit, and these form two-thirds of the whole system, we obtain naturally even more favorable figures. In the most unfavorable year, 1922, the interest amounted to 1.2 per cent. whilst for 1924 figure was 5.2 per cent.

A few notes on the organisation of the State Railways in general are not out of place and I will commence with the workshop as these stand in direct relation to the general development of the railways and as such their growth has been just as remarkable as that of the railways themselves.

Much has been done during the last fifteen years towards the development of the workshops with the result that at the present time the State Railways possess an organization which compares favourably in all respects with similar institutions in Europe and America. It speaks for itself that such an organization influences the financial results of the railway industry to no small extent, in as much as repairs can be quickly and economically carried out, a matter of no small importance where delay in delivery means heavy losses to the branch concerned.



Locomotive Repair Shop at the Manggarai Workshops

At the present time the State Railways in Java possess four large modern workshops, i.e. one at Manggarai (close to Batavia), one at Bandoeng, one at Madioen and one at Sourabaya. With the exception of that at Sourabaya these workshops are equipped for the reception of both locomotives and coaches and, in addition to repairs and maintenance, the construction of coaches also forms part of their activities. The machinery installed in the above mentioned workshops is all electrically driven and in addition there are two smaller workshops at Djember and Poerworedjo. Statistics show that on an average 11 per cent. of the total number of locomotives in service are under repair, the figures for coaches and trucks are 8 per cent and 4 per cent. respectively which under the circumstances must be regarded as satisfactory.

As regards fuel it is of interest to note that all locomotives in service on the Java lines burn local coal and wood with the exception of two American mountain engines which make use of petroleum residue.

Owing to the fact that the government coal mines have been able to deliver this article at prices below those demanded for foreign coals, it has been found possible to keep the fuel expenditure at a comparatively low level. The estimated value of the fuel used on the railways in Java is 8,000,00 guilders per annum.

That the State Railways places service above everything is shown by the fact that locomotives from all the principal machinery manufacturing countries have been tested and thus we see engines from British, American, Dutch and Swiss factories in service on the various lines in Java. In the same manner we see that no less than 13 countries have participated in the manufacture of the new electric locomotives and coaches—truly cosmopolitan rolling stock!

It is gratifying to see that the State Railways consider efficiency above the question of giving the preference to home industry and, by giving foreign concerns the opportunity of competing for the delivery of material, places itself in the position of being able to select the most suitable and efficient material. Supporting home industries is in itself an excellent proposition but in many cases it is adopted at the cost of the efficiency of the industry itself and in this respect the State Railways are broad minded enough to realise the advantage to be obtained by open competition.

To conclude these few notes on the organization it may be mentioned that at the present day more than 398,000 employees are in their service of which of course the greater majority are natives. When we consider that in 1878 this figure was somewhere in the region of 250 we have again a speaking example of the development of the railways in Java.

That only one strike of any importance bas been experienced speaks well for the spirit of their staff and employees in general and the fact that a considerable number of the strikers were reinstated after they had been discharged has no doubt done much to strengthen the relations between employer and employees.

This short review of the State Railways in Java and the Outer Possessions gives some idea of the development and future of this industry and it may be presumed that the spirit of the pioneers of this great asset to the welfare of the Netherlands East Indies is still alive to-day in the persons responsible for its further development. The State Railways of the Netherlands East Indies have a wonderful future in front of them and there is no reason why they should not eventually rise to a position second to none in all respects.

(The writer wishes to acknowledge the "Jubileumboek van de Staatsspoor-en Tramwegen in Nederlandsch Indië" as the source of the statistics mentioned in this article.)

China Stock and Share Handbook

Compiled and Published by C. R. Maguire, Shanghai, 1925. Price $6.00

An index filing cabinet is an essential part of every well ordered business office and an index of the financial details of the various companies with which he has dealings is essential to the man interested in Bonds, Stocks, Shares and Exchange. Such an index has been given publicity in the reproduction of the "China Stock and Share Handbook," which is a welcome revival by its former compiler whose absence at the war brought its publication to a temporary stop. The "China Stock and Share Handbook" always proved a useful and popular compendium of financial information, but the present edition will prove even more useful and popular than any of its predecessors.

It will prove to those who have an interest in the commercial, industrial and banking development of China the enormous strides the country has made and is making in these directions.

Each company dealt with has its financial position shown in tabulated form covering a period of years, so that its status as a public investment and furture possibilities becomes simplified to the person looking for sound investments. The Handbook is more for the guidance of the investor than for the mere speculator and should, therefore, prove a fund of information to those who want to carefully invest their small savings. It will prove of great utility to Chinese and Foreign investors alike, having returns of a large number of important Chinese undertakings and Chinese Government bonds and securities.

Economic Development of French Indo-China

By Ernest Roume, Former Governor General of French Indo-China

IN HIS masterful outline given at the inauguration of this series of lectures on the French Colonies, Mr. Albert Sarraut (former Minister of Colonies), speaking of France's civilizing mission, put side by side interest and duty of all colonizing nations, as concerns large scale development of production, and consequently wealth, of the colonies in their charge. The duty is not only to themselves, but in a greater measure, to the native populations for whose well being they are responsible; and in a still superior measure to humanity at large, the needs of which are ever growing—and who, if these moral obligations were neglected, would finally question the legitimacy of the mandate, so willingly accepted at first.

Nothing is more true. Those times are past, when a country could with impunity neglect the economic development of its colonies and leave their latent riches dormant. To-day, in cases of that kind, even the best established diplomatic titles would not be sufficient to safeguard colonies of that category; for sooner or later an avenging Nemesis would emerge, sister to the one who wrested Cuba, Porto Rico and the Philippines from their possessors. Without doubt, economic development of the material resources of a colony is not the only object worthy of attainment, but it makes conditions for all other progress, whether social, intellectual or moral. For, below a certain minimum of well-being, and if subsistence is precarious and aleatory, it would be in vain to try development of instruction and even effective sanitary improvement.

Hence, from every point of view, growth of production (and consequent wealth of a colony), is the fundamental touchstone of success or failure of the colonizing power; and it is in the light of these preliminary observations, that we shall examine France's economic achievements in Indo-China. In order to appreciate them with logic and justice, it seems best to recall in what condition we found this country at the time of our intervention. To do this we do not have to descend very far into the corridors of time, for the occupation of Cochin-China was achieved in 1867 while Cambodia accepted, or rather solicited our Protectorate; but it was only in 1889, that Annam and Tonking came within the French Indo-Chinese Union; though still in 1892, one of the first governors general, M. de Lanessan, could see from his residence on the right bank of the Red River, in Hanoi, the flames of the fires kindled on the left bank by the infamous "Black Flag" who still held the greatest part of the upper and midlands, to the Chinese frontiers.

What then did we find, from an economic point of view? A country in a state of lethargy, retired within itself, having no relations with the rest of the world except with a few nearby Chinese ports, a country exclusively agricultural, rice the basis of alimentation, being the main product. The map shows you, that French Indo-China has the outline of a gigantic capital "S," the open curves occupied by the deltas of her great beneficent rivers, the Red River and the Mekong, connected by the Annamese Mountain chain, 900 kilometers long, leaving on the Annam coast just enough room for a few lateral valleys, but in the west, approaching the Mekong River in the form of vast plateaus, called the Laos. The Annamese describe this letter "S" in a more picturesque and descriptive way: they compare it to the long stick of bamboo they carry, from each end of which is supended a basket of rice.

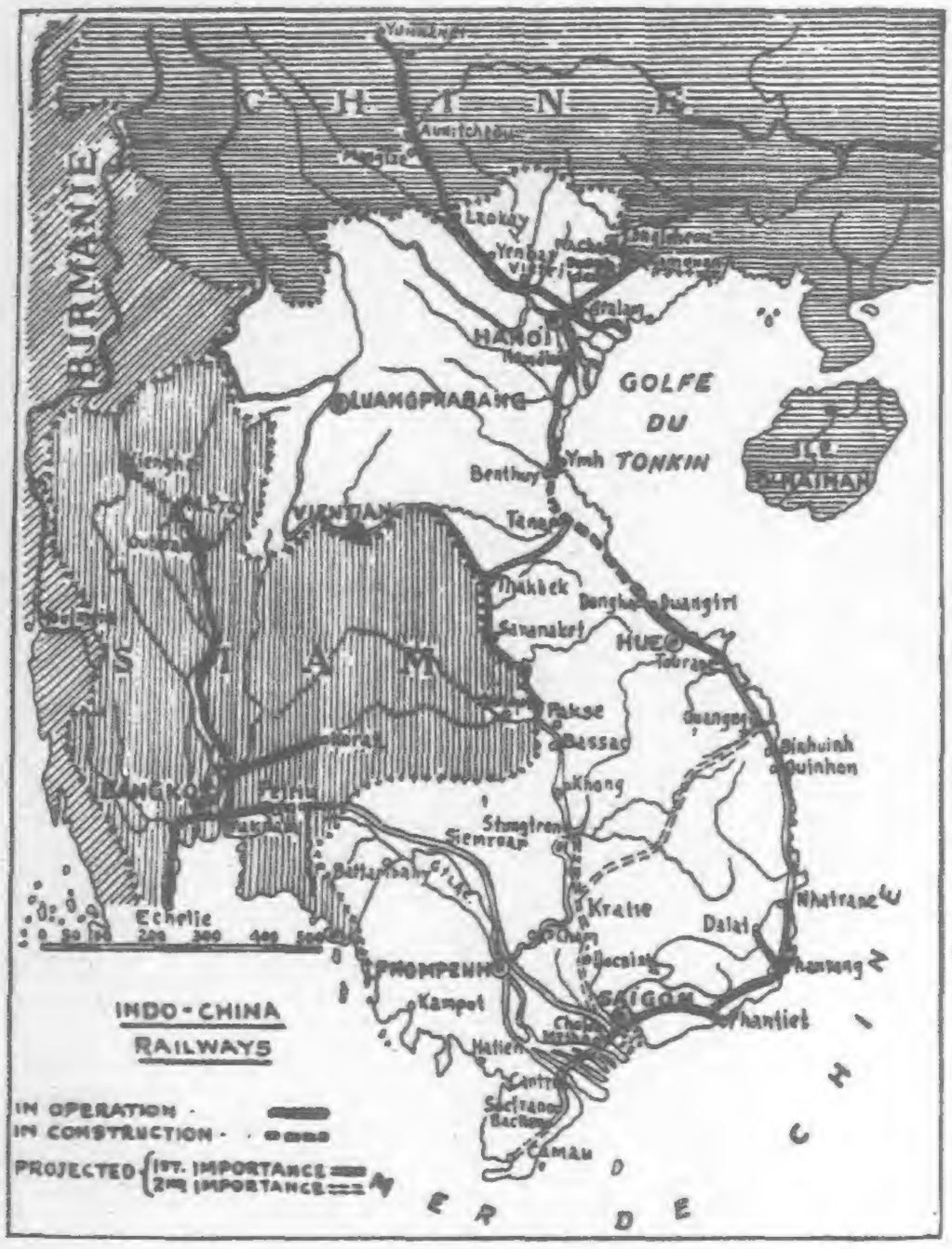
It is impossible, no census having been taken before that epoch, to give the number of inhabitants at the time of our establishment; but though bigger now, population was already then concentrated in the delta of Tonking and in North Annam.

Along the 2,500 kilometers of coastline, there was not one well equipped port; just simple shelters, often precarious, for sailing vessels of small tonnage. There were no roads, only trails for pack animals; to offset this there were many navigable waterways, making possible the circulation of numerous junks. On account of these limited means of transportation, provinces out of reach of these water routes were exposed to famine, when the rice harvest was insufficient. I have myself witnessed calamities of this kind, as late as 1898, at Hué, the Capital City of the kingdom of Annam. This was before the railway, now connecting the port of Tourane with Hué, had been constructed. In 1898 those two cities were connected only by a difficult trail via the pass of "Nuages" and accessible only to pack animals, and in spite of all possible efforts the means of re-victualling were cruelly insufficient. For a long time we have not witnessed in Europe—outside of Russia—the horrible fact of a starving population, and thanks to French enterprise, Indo-China will not pass through this experience again. But even outside of these extreme famine cases, we found the people undernourished and consequently not very strong. This has been greatly corrected and improved. The way matters stood, there could, naturally be no question of considerable exterior commerce, so during the first few years of our occupations, this commerce consisted mainly of importing merchandise necessary for the upkeep of the troops and functionaries. And now I have arrived at my starting point: how has the very mediocre economic situation of Indo-China improved under French rule?

Navigable Waterways in French Indo-China

Rice and Other Cereals

I have already indicated that rice is the basis of agriculture in Indo-China; it is in fact more important for that country than wheat is for us. The nature of the soil, especially in the great deltas of the Red River and the Mekong, the atmospherical conditions, greatly favor this cereal, not only in Indo-China, but also in Siam and Burma. It is a national cultivation, placed under



invocation of the earth protecting genii ; and even now the Emperor of Annam in person celebrates the " Feast of Tillage." A native song quoted by M. de Tessan in his very interesting book " Asia Awakened," says " How could man exist without his ricefield ! The buffalo has grass, man has rice." It is certain we do not have to teach the Annamese people how to cultivate rice. They have done it for centuries, and their irrigation works are remarkable, considering their limited means of action. And nevertheless, what a vigorous impulsion we have been able to give to the extension of this cultivation, thanks to methodical application of hydraulic agricultural works, having the threefold objects of : first, fight, against inundation ; second, drainage of low lands ; third, irrigation of high lands. In Tonking, the works for strengthening the Annamese dikes, begun fifteen years ago, are almost finished ; and frequent breaks devastating the Tonkin provinces are now a thing of the past.

In Cochin-China, openings of great canals, draining the low lands and serving navigation have been taking place now for over forty years. Since 1893, when the " Societe des Dragages de Cochin-Chine" used powerful mechanical means, 520 kilometers of large canals and over 2,000 kilometers of medium large canals have been due ; 120 million cubic meters — more than was necessary for the Suez Canal — have been dredged, at an expense of about 100 million francs (gold). Irrigation of the high lands, presenting more technical difficulties, were undertaken later, after thorough study and investigation in Java and British India. It was found that from 6 to 700,000 hectares could be irrigated by both gravity and pumping. The first part of these works, 120,000 hectares, is completed, and it is estimated that it will take ten years to complete all of the planned irrigation works and twenty years for draining the 50,000 hectares in Tonkin, and the 600,000 in Cochin-China.

Now for the Results

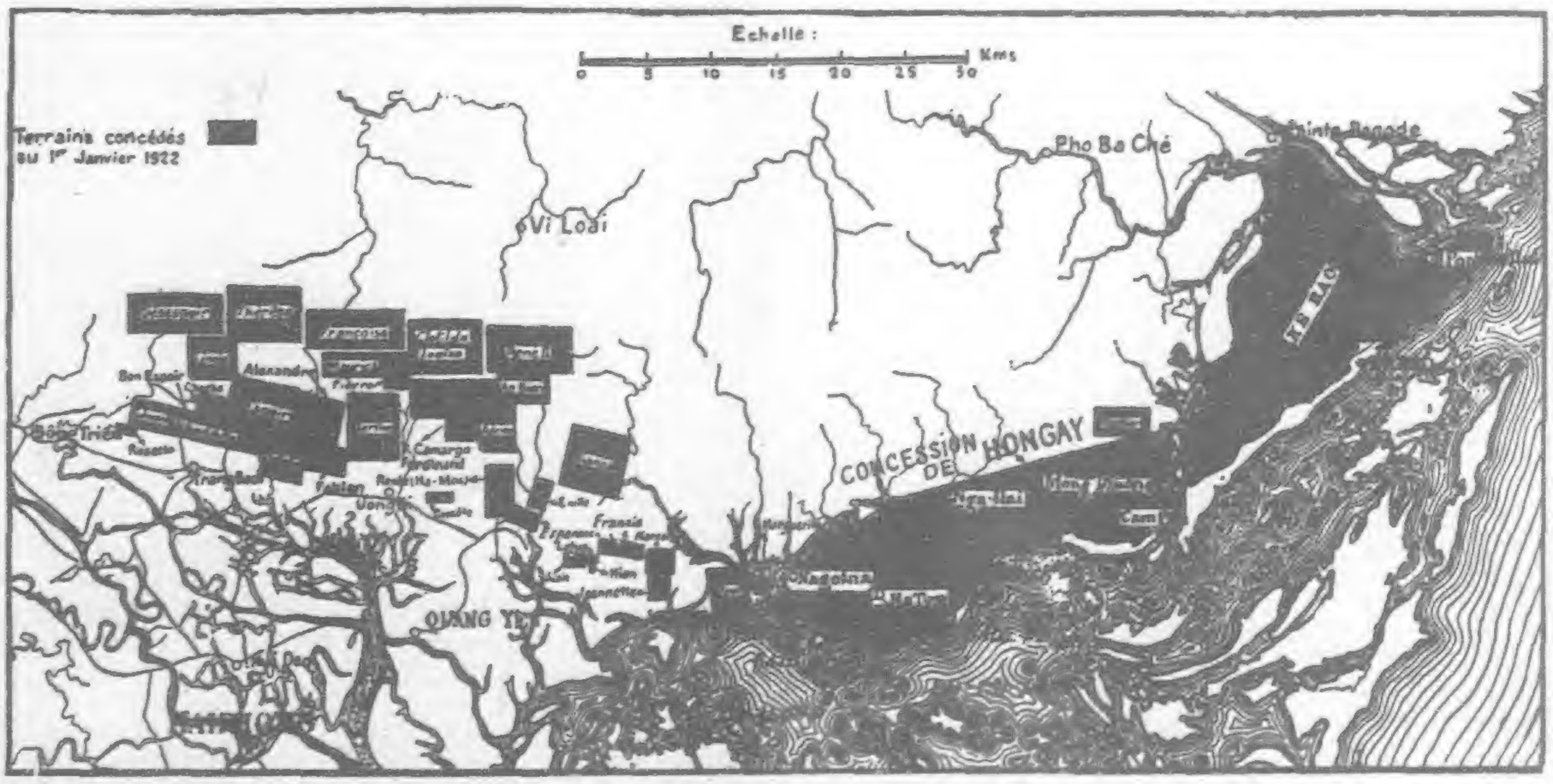
In Cochin-China, from 1879 to 1923, in 44 years, the area of rice fields grew from less than 400,000 hectares, to over 1,900,000, i. e. almost multiplied by five, rice exports passed from 250,000 to 1,200,000 tons, and the population of Cochin-China from one million and a half to 3,900,000. The total rice production of French Indo-China yearly is not less than from seven to eight million tons, four to five of which are for local consumption, four to five hundred thousand for seed, about 200,000 for distillation, and the remainder, two or two and a half million for export. Among the export items of 1923, rice alone represents a value of 652 million francs, i. e., more than half of Indo-China's total exports. To-day, the rice production of French Indo-China is considered equal, if not superior, to that of Burma, the latter having had until lately, first place in the world's markets. And when the works mentioned above are completed, adding more than one million hectares to the two million already under cultivation, what a magnificent perspective will be open to our beautiful Indo-China Colony. But out efforts do not stop at quantity production, but concern themselves also with improvement in quality. Thus the " Societe des Distilleries de l'Indo-Chine " is efficaciously cooperating with the government, by successfully using in its plants, mechanical devices for sorting the " paddy ' thus lessening cost of manipulation.

Other Cereals

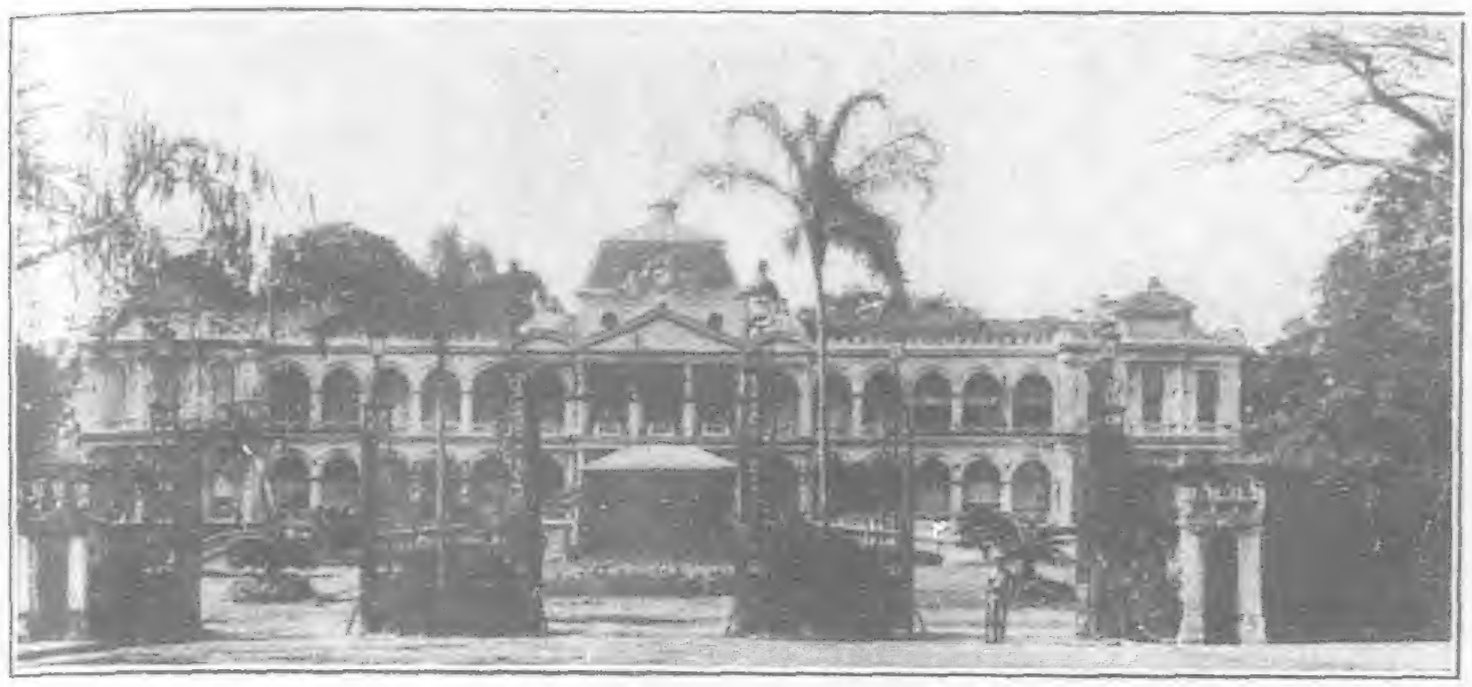
Outside of rice, Indo-China produces—under very favorable conditions—maize (corn) which also has an important place in native alimentation, and even in export, especially to France. Twenty-five years ago, maize, as an export item, was insignificant, but in 1905, the quantity exported suddenly jumped from a few hundred tons to sixteen thousand tons, increasing from year to year, reaching 133,000 tons in 1913. The war interrupting, this record has not as yet been repeated, the last yearly statistics showing 62,000 tons. This went almost exclusively to France, which is the more interesting when one knows that she imports yearly several hundred thousands of tons of maize, and therefore could easily buy more of this product from her own colony to mutual benefit.

Sericulture

Another agricultural asset of French Indo-China of local and French interest is mulberry-tree planting and consequent sericulture. The mulberry tree grows everywhere in Indo-China, even in the poorest soil ; and silkworm raising and the spinning and weaving of silk are occupations well adapted to native character and greatly followed in Annam, Tonkin and Cambodia. But before our intervention, production was mediocre, both in quantity and quality, and barely sufficing for local needs. Under the steady guidance of French technicians, merchants and administrative



Non-bituminous coal-field of Along Bay and Dong-Trieu



The Palace of the Governor General of Indo-China

agents—particularly Lyonese—the silk industry is undergoing marvelous transformation.

Rubber

The agricultural products I have mentioned so far, have existed from time immemorial. All we had to do, was to extend and perfect them. This is not the case concerning rubber, which was originally introduced there by us, and at a comparatively recent date, since it was in 1906 only, that this industry became somewhat important. The initiative was altogether private, and due to the great success of rubber planting in the neighboring countries of Indo-China, in Malaysia, the Dutch Indies, and Ceylon, where climatic conditions are similar to those in our colony. These initiatives were happily seconded by the administrative powers, by liberal concessionary terms on the one hand, and efficacious financial aid on the other hand, by way of loans granted the "Banque de l'Indo-Chine," guaranteed by the colony, when the infant industry struggled against heavy odds, resulting from the war. These difficulties have happily been overcome, and rubber production is flourishing to-day. In the eastern part of Cochin-China, and in Cambodia alone, there are 250 plantations, from small ones of 100 hectares or less, exploited by individuals, many of whom are natives to big plantations of several thousand hectares, belonging to corporations, and provided with perfect and modern equipment. Rubber cultivation being a new industry in Indo-China, it had the advantage of being able to profit by the example of her neighbors, thus avoiding costly experimenting, and beginning with right methods and modern equipment.

Add to this that French Indo-China possesses the ideal soil for this cultivation, her now famous gray and red soil, especially in Cochin-China, and Cambodia, and you will understand that rubber-planting there has a great future in store. Already in 1923, French Indo-China exported nearly 6,000 tons of rubber, valued at twenty-eight million francs, three-fourths of which went to French markets, reducing thus—though much too little as yet—the heavy tribute paid by France to foreign production. But the sum will be ever progressing, for a full yield of the present trees will not be had before 1926, when the quantity will be at least 10,000 tons. This too, will be quickly surpassed, because new plantations are being created all the time, and the day will dawn, when French rubber consumption will be completely supplied by her Indo-Chinese colony. This result will certainly be hastened, if tariff advantages—no matter how slight—will be granted.

Sugar—Spices

The fertile soil of our Far Eastern colony can supply the world with many other products, such as sugar, vegetable oils, cotton, flax, ramie, agave, jute, tobacco, coffee, tea, cinnamon, pepper, though most all of these are far from properly developed. The best developed of these is that of pepper, in the regions on the Gulf of Siam as far as Cochin-China and Cambodia. It is a little known fact, that nearly all the pepper consumed in France, originates in this region. Out of a total production of about 31,000 quintals, valued at fourteen and a half millions of francs 30,000 go to France. Indo-China is situated in natural sugar cane zones and within proximity of the region where sugar cane planting has acquired great importance and "perfection": Java, Philippines, Borneo. Of course, our natives have planted sugar cane from time immemorial, but using primitive means. The native mills register from one to two tons of sugar to a hectare of cane, while La Martinique registers six; Java, ten; and Honolulu more than twenty. You will see that there is much to be done. Sugar cane planting has to become rational, and already several corporations have been formed in Cochin-China and Annam, with this object in view. Modern refineries are in course of construction. The movement is in progress.

Vegetable Oils, Coffee, Tea

Everybody recognizes the primary importance of oil production. Every day discovers new sources and new uses. Within fifteen or twenty years the world's markets of fats and oils will dictate to and regulate those of carburants, and Indo-China will have an advantageous place in those markets. The oil palm, best producer of industrial oils, has been successfully introduced in Indo-China: while the cocoanut palm is indigenous to this country, and plantations of it can, with little cost, be extended into the immense areas of the alluvions of the Cochin-China delta and in fact this work has been commenced. Ricine grows everywhere, above all in Tonkin. During the war, for needs of national defense, mostly for aeronautics, 3,000 tons of this grain has been sent to France. The coffee plant, after much experimentation, has been acclimated, Tonkin again giving best results. Indo-China could produce great quantities of tea. A big corporation has been organized for creating vast tea plantations in South Annam and others are following this example.

Tobacco

Tests made by the "Commission Interministerielle" of tobacco originating in Indo-China, demonstrate that certain kinds, notably from Tonkin and Annam, fulfill the requirements of the "Regie" (French Government Monopoly of Tobacco). The Minister of Finances proposes to send to the colony, a Commission, to buy for the government, as was done with Madagascar. On the other hand, a French Company, purporting rational cultivation and marketing of Indo-China tobacco, has been incorporated recently.

Textiles

Among the textile plants, cotton is necessarily attracting the greatest attention, on account of an impending scarcity of this raw material, greatly feared by the European cotton industry. Therefore it is good to know that cotton grows readily in all parts of Indo-China, but particularly in Cambodia on the banks called "chamcars" and like those of the Nile alternately inundated and drained off—of the great Mekong river. But native production is rudimentary and it will take much experimentation—a thing that is true of all tropical cultivation. This problem cannot be properly solved by the "Colons." A well constituted scientific Agronomic service alone can do this satisfactorily. And here truth obliges me to state, that in our Indo-China, this service is not as good as it should be, while in Java, Malaysia and Ceylon, it is powerfully organized. To be efficacious, these services should be autonomous, sufficiently financed, created with the collaboration of the Colonial governments and interested Colons, but independent of administrative and financial fluctuations. In this respect, we have a perfect model before our eyes in the admirable Colonial Pasteur Institutes rendering such great service, both scientific and practical, concerning maladies and infections—human, animal and vegetable—because their organization satisfies conditions of stability and continuity without which there would be only confusion and little result.

Fisheries

An efficient point of view is happily found in French Indo-, China's Oceanographic Service of Fisheries, which, truly scientific is connected with the laboratory of M. Gruvel, Professor at the Museum of Natural History, in Paris, and who for the last twenty years has devoted his studies and work to the research and rational exploitation of the ichthyological wealth of our colonies.

The 2,500 kilometers of French Indo-China coastline, and the great rivers and lakes, are indeed very rich in fish of all kinds. The Annamese are not only tillers of the soil, but fishermen, and fish adds to their principal food of rice, the necessary azotes. Though their fishing equipment is altogether rudimentary and insufficient, nevertheless and because of the very richness of their waters, they export yearly great quantities of dried and salt fish, and shrimps to China, representing about a hundred million francs.

Forestry

The service of Forestry also is most efficient. The great Indo-Chinese forests, covering considerable areas in the mountainous regions had been neglected before our coming. We are re-constituting them methodically—and more than two million hectares have been put in reserve, and protected from depredations and fires. These forests contain from 700 to 800 kinds of wood ranging from those for building purposes to the finest of cabinet woods.

Industries—Coal and Other Minerals

Less than 20 years ago, a summary resumé, like the present one, regarding the economic resources of Indo-China, might have been closed here. Indeed Indo-China was a quasi-exclusively agricultural country, and offered nothing but a restricted industry, limited by the satisfaction of the elementary domestic needs.

It is no more so: Now-a-days this country has embarked on the great industrial eddy, which sweeps away and transforms our planet, and the characteristics of which I wish to indicate here, as far as they concern our subject.

Tonkin is essentially the center of the industrial power of Indo-China: it is here indeed, that are found the constituent elements of the industrial production, coal, ore deposits, and manual labour.

First of all, coal; it is chiefly anthracite, the formation of which spreads over a length of more than 100 kilometers, parallel to the north shore of Tonkin, where it rises to the level of the sea. It is an excellent fuel that burns without smoke and leaves no waste. By mixing it with Japanese soft coal (charbon gras) for which they now begin to substitute Tonkin soft coal, some agglomerations are obtained, by merely adding, through distillation, some black rosin or some coke.

The powerful and very prosperous Company of the Tonkin Collieries operates, at Hongay, the strata that are nearest to the sea, most of which are in the open; out of nearly one million tons' yield, about two-thirds are exported.

Some other important Companies have undertaken the exploitation of several concessions in the same region, so that a rapid development of the production is assured. But there is not only anthracite, in the Tonkin, there is also, very luckily, soft coal, with 23% of volatile matter, which is an excellent coke-coal; and this is all the more interesting, because these mines—and the Phan-Me mine particularly—are in a region where are to be found rich deposits of iron ore, so that you can judge at once of the perspectives that are opening up, and which are being studied very closely as regards iron metallurgy.

Zinc

The foregoing regards the future—perhaps a near future; for the present, it is zinc which constitutes the principal mineral wealth exploited in Tonkin. There are, in fact, in Upper Tonkin, three rich mines of zinc calamine (native carbonate of zinc) from which were exported in 1923 about 33,000 tons of ore, valued at 23,000,000 of francs.

But—and this is what defines most clearly the new state of industrial evolution into which Indo-China has just entered—they are no longer content with the export of ore, but are shortly to treat this ore in Tonkin where a foundry or smelting plant has been erected near Haiphong, by the "Mines and Metallurgic Company," which is itself a branch of a large French metallurgic enterprise.

Besides this, Tonkin possesses two very important groups of tin mines, the one situated in Upper Tonkin, the other in Laos besides in Tonkin, there are deposits of lead, with notable silver quantities, which have in times past been actively exploited by the natives, and which are again actively prospected; there are also deposits of auriferous quartz and of graphite.

This rapid enumeration, though too summary a resumé of the report presented last year to the Industrial Institute of Northern France by General Inspector of the Lantenois mines, ex-Chief of the Indo-China Mines Service, will suffice, however, to give an idea of the importance and of the variety of the mines of our colony.

But how many more resources does she not contain! Both in Tonkin and in Cambodge are deposits of phosphates, the working of which have already been begun and are giving rise to the greatest expectations; calcareous deposits of great aboundance, deposits of china or porcelain clay, treated as fireproof clay, and used for the ceramic art.

One of the most important and prosperous industries of Indo-China is that of the artificial Portland Cements, at Haiphong, which, besides supplying the needs of the colony, exports nearly 60,000 tons, and is buying machinery and preparing for a swift increase of production.

Close to Hué, the Company of hydraulic Limes of the Lang-Tho, is working some quarries of hydraulic lime stone, yielding 12,000 tons of hydraulic lime, cement blocks and divers ceramic and fireproof products.

Primal elements for the manufacture of glass are found both in Tonkin and Annam, and are of excellent quality, and the trade for this product is practically without limit, both in Indo-China and in all of the Far East; this industry is therefore actively pursued now, and it will receive an added impetus by the establishment in Haiphong of a new and very important plant, that is being started by the Company of Glass-works of the Far East,

Lastly, the great Chemical Industry, the production of corrosive glass-wort or soda-ash, of chloride of lime and of hydrochloric acid, has just begun to develop at Haiphong, which is fast becoming the most powerful industrial center of Indo-China, and to hold a first-rank importance in the Orient.

This industry is feeding the manufacture of paper, which has at hand a very remarkable primal element in the bamboo, that is thriving here in great profusion; this new industry is also developing at a quick pace.

I have already touched, while speaking of the rice, upon the textile plants, and generally on agricultural products, and industries based on these products; of the imposing group of the Cholon and the Tonkin ricefields, of the great distilleries, of the spinning and weaving of both cotton and silk, of the manufactures and the treatment accorded to later and India-rubber, and of the manufacture of tobaccos in Hanoi. The limitation, necessarily restricted, of this Lecture, would hardly allow me to extend my remarks on this subject beyond the present scope and I can but wish that this summary and very incomplete review may leave with you a sufficiently clear perception of the industrial resources of Indo-China, and of what may shortly be expected of their full development.

Capital Invested

All this vast complexity of agricultural and industrial productions has been possible only thanks to the bringing into play of capital, the importance of whcih is daily growing. The Economic Agency of Indo-China has kindly given me regarding this subject some figures which—though they can be but approximate—I believe will prove interesting.

On December 31st, 1923, the nominal value of capital invested in Indo-China and quoted on the Paris Exchange, amounted to 1,208,640,000 francs and adding to this the amount of the local loan of 6,180,000 "piastres," which represents, at par of 10 francs per "piastre," 61,800,000 francs, we reach the total of 1,270,440,000 francs.

Taking into consideration, besides this, the capital invested in enterprises which are not belonging to this class of anonymous companies and some of which are very important, it is no exaggeration if we value at nearly two billion the nominal value of capital invested—by a majority of French people—in Indo-China up to the 31st December, 1923.

But it is particularly interesting to note that in the single year of 1924 to this sum has been added 328,000,000 francs, augmenting the capital of existing companies and for the formation of the new companies.

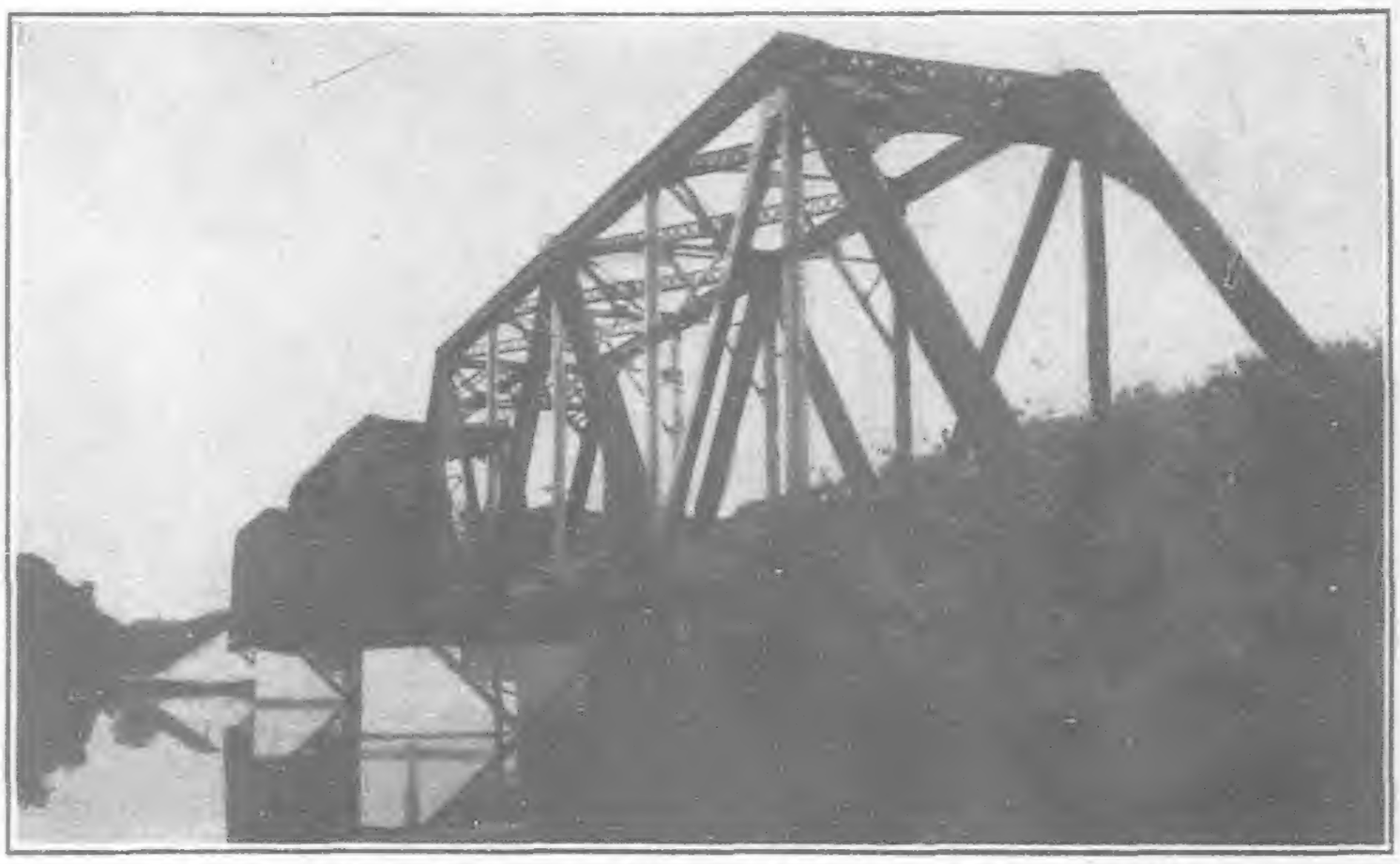
Moreover, we have not taken into consideration the increased value, often very considerable, of capital primarily invested; but it is certain that the actual value of the capital invested in Indo-China would greatly exceed three billion.

It *is* a beginning, but it is *only* a beginning: these figures cannot be compared with the capital invested in the near-by foreign colonies; it is necessary therefore that they should be substantially augmented if the integral value of Indo-China is to be reached, for to-day she has scarcely attained one-fourth of her rightful value.

The Manila Railroads

THE physical condition of the property of the Manila Railroad Company—roadbed, rolling stock, and structures—was never as good as it is at the present time. This statement is made not with a view to reflecting on former ownership or managements, but to draw attention to the fact that the investment of surplus earnings in permanent improvements and betterments and additions to rolling stock during the past three years has had its logical result. In confirmation of the above, it is pleasing to record that former President and General Manager Horace L. Higgins, after traveling over the entire system to inspect the property on behalf of the English bondholders a year ago October, remarked to the officials who accompanied him that he was extremely surprised and gratified at the most excellent and greatly improved condition in which he found the property and would so report to his principals, The Manila Railway Company (1906) Ltd., of London.

This improvement program is already beginning to have a favorable effect on operations. Raising the track level in various sections of the line, replacement of wooden pile trestles with permanent steel bridges, grade reduction and elimination of curves has tended and will tend toward greater operating economies and minimize the costly and vexatious interruptions to traffic caused by washouts during future rainy seasons. Furthermore, the added equipment units of greater capacity and strength have decreased equipment maintenance costs per car and conduced toward greater transportation efficiency.



Guinayangan River Bridge near Aloneros, Main Line South, Three 40-Meter Through Spans

Railway Location

During 1924 the location of the Main Line South from Km. 332, about 12 kilometers beyond the town of Ragay, Camarines Sur, to Km. 370. the end of the constructed line at Pamplona, a distance of 38 kilometers, was completed. This shows the total distance between the rail heads at Aloneros and Pamplona to be 108 kilometers.

In December, 1923, the investigation and survey for a railroad line from Tarlac, Tarlac, to San Jose, Nueva Ecija, a distance of 55 kilometers, by way of the towns of Victoria, Guimba, and Muñoz was authorized. A line along this route would serve two purposes :

1. Direct railroad connection to the Main Line North at Tarlac for a well-populated, fertile region, producing a large tonnage of rice and sugar cane.
2. San Jose is the point where the new first-class highway known as the Santa Fe Road, running from San Jose northward into Nueva Vizcaya, begins. This road will eventually give ready access to the Cagayan Valley and motor traffic already developing will serve as a feeder to the railway line if constructed. San Jose itself is the center of an extensive rice-growing district now served by bull-cart and truck transportation to the town of Cabanatuan. At San Jose a modern Government irrigation system, known as the Talavera System, at present serving an area of approximately 5,000 hectares, is nearing completion. An additional area of 3,000 hectares will be served by the next planting season.

The survey of this line was made during 1924 on a maximum grade of four-tenths of 1 per cent. This line could be economically constructed as the erection of long and expensive bridges would be avoided.

Railway Construction

That portion of the Main Line South between Calle Herran, Paco (Km. 9.620), and a point between Balagbag and Sucat (Km. 22.550), had been giving considerable trouble and causing uneconomical operation in former years on account of frequency of washouts, steep grades, sharp curves, and inadequate siding facilities at Culiculi and Balagbag. Extensive construction work was necessary, which has been practically completed during the past year. This work may be apportioned roughly to three main divisions :

1. From Km. 9.620, beginning at Calle Herran just south

Pile Trestle Connecting end of Calle Azcarraga with Farola Properties

Tutuban Railroad Station, Tondo, Manila

of Paco Station, to Km. 13,500 at Culi-culi station, the raising of the grade an average of 2-ft. above the former level.

2. From Culi-culi to Km. 21, three kilometers south of Balagbag station, the rectification of the grade by cutting down elevations and filling in depressions. This has been one of the most irregular pieces of track on the railroad and the grade reduction was absolutely necessary in order to facilitate economical operation, especially at Balagbag station which was on a high ridge, with inadequate sidings.
3. From Km. 21,100 to Km. 22,550, between Balagbag and Sucat, a new location of the line, which has straightened out a long reverse curve and reduced the grade. For this purpose it was necessary to acquire two kilometers additional right of way.

The maximum grade on this section has been reduced from 2 per cent. to 1 per cent., compensated, and heavy maintenance costs due to washouts during future rainy seasons will undoubtedly be avoided. It may be added that prior to the accomplishment of this work it was necessary to keep a helper engine continually available at Paco to assist heavy freight trains over the high ridge at Balagbag. The total cost for this work was estimated at £320,000, but the amount actually expended on the project was approximately £250,000.

Maintenance of Way

During the year 1924 there were 121,619 ties used in the maintenance of operated lines, most of which were molave and the balance yacal. This is an increase of 20,793 over 1923.

All wooden bridges except those replaced by permanent structures were maintained in good condition. The maintenance of buildings was given special attention, the work in several cases being reconstruction and painting. (See previous comment regarding Maintenance of Way and Structures.)

Additions and Betterments

The yard trackage at the following stations was increased as follows :

	Meters
Dau	650.00
Culi-culi	428,00
Bauang Sur	381.00
Manila Deposito	725.00
Sucat	384.00
Total	2,568.00

Industrial spurs were constructed as follows :

	Meters
Km. 112.253 Main Line South, Carabao Coconut Company	440.85
Km. 72.400 San Pablo Cut-Off, Calamba Sugar Estate ...	88.72
Km. 66.099 Batangas Line, Calamba Sugar Estate ...	94.00
Km. 74.038 San Pablo Cut-Off, Laguna Sugar Corporation	95.73
Km. 90.577 Batangas Line, Philippine Sugar Estates Development Company	92.45
Km. 40.375 Cabanatuan Line, Hermogenes Reyes ...	75.00
Total	886.75

Steel Bridges Constructed

Twelve (12) permanent steel bridges with concrete abutments were constructed to replace old wooden trestles at the following places :

Km. 70.45, Main Line North	... One 7-foot I-Beam Girder.
Km. 63.22, Florida Blanca Branch	... One 45-foot thru span.
Km. 63.62, Florida Blanca Branch	... One 33-foot thru span.
Km. 65.90, Florida Blanca Branch	... One 33-foot thru span.
Km. 84.24, Florida Blanca Branch	... One 36-foot thru span.
Km. 34.35, Main Line South	... One 16-meter thru span.
Km. 117.53, Main Line South	... Five 15-foot I-Beam Girder.
Km. 117.84, Main Line South	... One 100-foot thru span.
Km. 119.50, Main Line South	... One 60-foot thru span.
Guinayangan River Bridge, Main Line South	... Three 40-meter thru span.
Km. 71.98, Pagsanjan Branch	... One 70-foot thru span.
Km. 134.400, Main Line South	... One 50-foot thru span.

Other Construction

Wooden station buildings on concrete foundations were constructed at Tablante, Alacan, and Culi-culi.

At Hondagua two (2) industrial warehouses for depositing copra were built with corrugated galvanized iron sidings, wooden framing, and concrete foundations.

At Aloneros a bunkhouse was built for the train crews that sleep at Aloneros. Besides, the pump house was extended to accommodate the Delco Light Plant.

An outgoing freight platform was constructed at Manila.

At Calamba a reinforced concrete fence 940 meters long was constructed enclosing the whole yard.

A permanent galvanized iron pole telegraph line was constructed from Lucena to Siain, 67 kilometers in length.

An additional water crane was put in at San Fabian station.

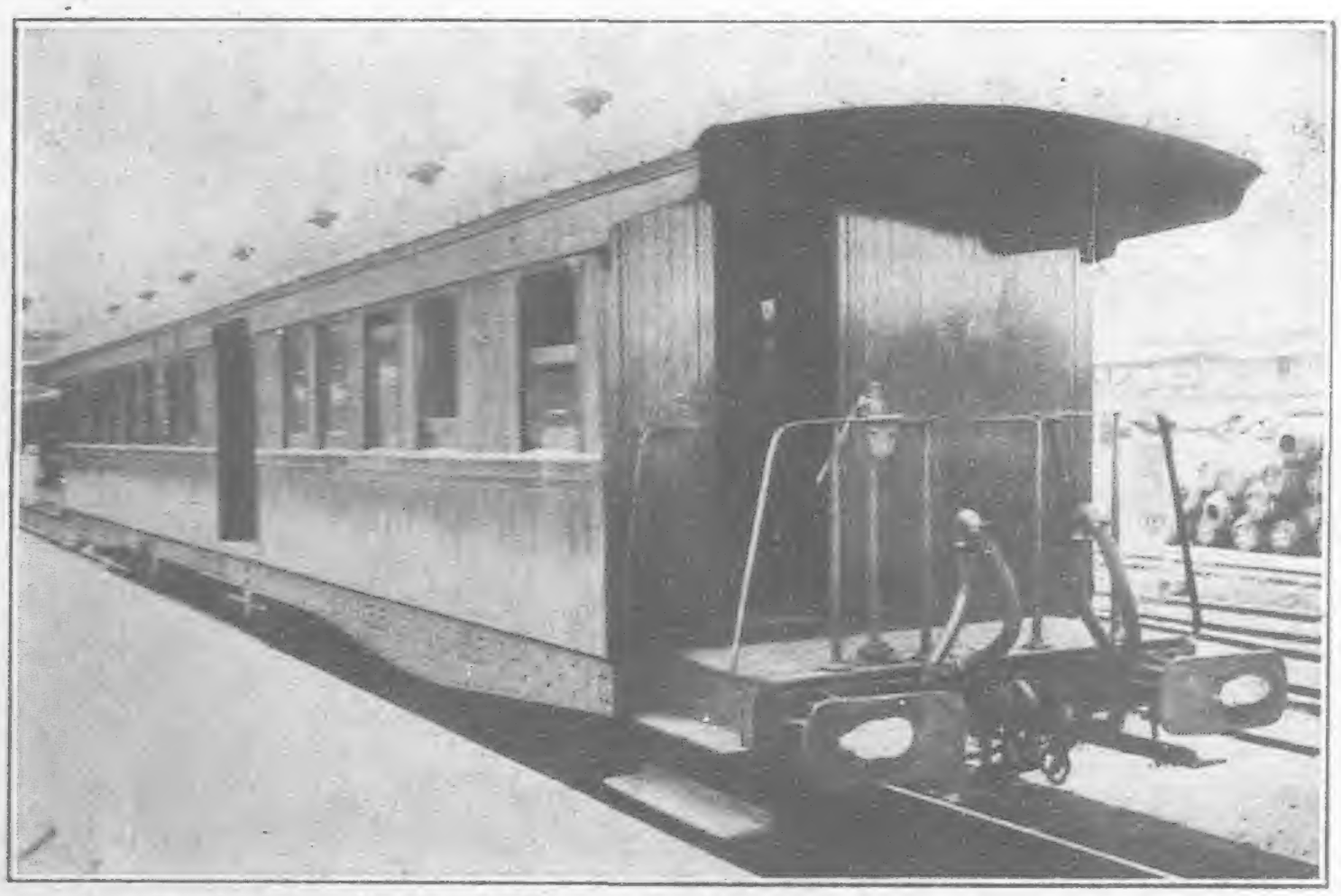
An artesian well and permanent water tank was constructed at Calanutan station on the Tayug Branch.

An additional tract of land was purchased and an entrance road built at Santibañez terminal in Paco.

An additional tract of land of 12,300 square meters was purchased at Manila Terminal along Calle Dagupan and a reinforced concrete retaining wall and fence, 1,434 meters long was constructed on the Calle Dagupan side of the Terminal Yard. A wire fence with reinforced concrete posts 940 meters long was constructed between Calle Solis and the City Limits.

On the Cabanatuan Branch there were placed 16,193 ties as a capital charge thereby bringing the number of ties per kilometer up to standard.

Tondo Reclamation Work.—The Company was finally granted by the Government of the Philippine Islands a lease to the foreshore land on Manila Bay north of the Pasig River as described in its application No. 170 to the Director of Lands. The purpose in obtaining this lease was to secure foreshore rights so as (1) to permit of the construction of a pile trestle from the end of Calle Azcarraga to connect with the plants of the Atlantic, Gulf and Pacific Company and the Pacific Commercial Company near the mouth of the Pasig River and (2) to reclaim the area between this trestle and the bay front by dredging and filling, which area would then be utilized for yard space by the Company.



New Combination Coach with First and Third-Class Compartments and Baggage Room Between. Length, 65 Feet, with 6-Wheel Trucks

The first part of this construction has now been accomplished by the completion of a trestle 560 meters in length running from Calle Azcarraga across a portion of the bay to the plants of the companies above mentioned. Thirty thousand pesos of the cost of this trestle work was advanced by the Atlantic, Gulf and Pacific Company and the Pacific Commercial Company in equal amounts, with the understanding that they will be reimbursed by deductions from freight charges on future shipments made by them over the new line. The second part of the work will probably be completed during 1925.

This project was initiated in order to accomplish the following results :

1. Yard space fronting directly on the North Harbor of Manila Bay will permit the removal of the present coal yard at Pandacan to the new-filled area, producing a considerable saving in lighterage costs.

2. The securing of rail access to the plants of the Atlantic, Gulf and Pacific Company and the Pacific Commercial Company as mentioned above, producing additional revenues.

3. At present there is great congestion on the Murallon on account of the entirely inadequate facilities, causing great delays in handling of cars and consequent extra expense. The new trackage will permit more expenditions unloading of sugar shipped from the mills for export onto lighters and avoid the congestion referred to.

4. The necessary land will be provided for the layout of the proposed line to the South Harbor to connect with the piers.

The Manila Railroad Company has its head offices and central terminal in the City of Manila and operates 1,039.14 kilometers of lines in the Island of Luzon. It also owns nearly fifty kilometers of road now under construction. The company has two main lines—northern and southern. The northern line extends from Manila through the rich agricultural provinces of Central Luzon to Bauang Sur and Eastern Pangasinan. Spurs run from this line, east and west, reaching most of the important agricultural and industrial centers in the different provinces. The company contemplates the extension in the near future of its present branch-lines terminating at Cabanatuan, Nueva Ecija, to Aparri, the northernmost port of the Philippines. The proposed extension is to run through the provinces of Nueva Ecija, Nueva Vizcaya and the entire Cagayan Valley, famous for its tobacco products. The southern line extends from Manila to the town of Calawag in Tayabas Province, and runs through the Provinces of Rizal, Cavite, Laguna, Batangas, and Tayabas. A line twelve kilometers long is also being constructed so as to extend this southern terminal to Guinayangan. The company also owns two short lines in the Provinces of Camarines Sur and Albay, of which Legaspi is the head terminal. The main southern line will also be connected with the present line from Naga to Legaspi, and when all these new extensions are completed the lines of the company will extend from the northernmost parts of Luzon almost to its southernmost extremity.

Modern Machinery Gaining Popularity in Nanking

LIGHT machinery, such as sewing, hosiery-knitting and cotton-ginning machines, have been gainning popularity in recent years in Nanking. Although Nanking is not yet industrialized and although most of the industries have not yet advanced beyond the handicraft stage, these modern labor-saving devices, because of their cheapness and portability, are extensively used by those engaged in different kinds of domestic industry.

The iron cotton ginning machine has been in use in China for decades, but its advantages in speed and efficiency attracted little attention on the part of Nanking farmers until very recently. Ten or fifteen years ago, cotton growing was not so popular as it is now. Through the encouragement of the Nanking schools, the cotton area in the Nanking district has been rapidly extended in the past few years. For ginning raw cotton, Nanking farmers formerly used a type of crude wooden machine which had many disadvantages compared with the modern type. The old Chinese wooden gin had a very limited working capacity and the lint was not always free from pieces of broken seeds. The presence of such impurities greatly detracted from the value of the lint, which always commanded a lower price on the market than Shanghai or Nantungchow cotton, which is ginned by modern machinery. The cheapness of the modern iron ginning machine also recommends itself to the Nanking farmers. At present, most of the cotton farmers in Nanking suburbs and neighboring districts boast of having at least one iron ginning machine in each family. An iron machine turned out by the local foundries or iron works is sold at only $25-$26. Tung Tai Yung at Chi Hsiang Chieh, Nanking, is one of the well-known makers of such machines. Since the middle of May this year, over 300 cotton ginning machines have been sold by this establishment alone. Most of the old Chinese wooden ginning machines in Nanking have now been totally discarded.

Another modern device which has found favor among the Nanking hand-workers is the sewing machine. This machine is employed mostly by Nanking tailors and seamstresses. In Nanking tailor shops it is employed in making not only foreign-style clothing, but also Chinese clothing and articles like curtains, hat bands etc. There are three classes of seamstresses who make a living by means of this machine. A well-to-do seamstress generally keeps a small establishment employing two or three hands and owning a few sewing machines. She does sewing work on a piece work basis. These establishments also sell odds and ends as a side line. The less prosperous seamstresses keep stalls in the corners or any other spare space of general stores. In this case, the seamstress has only one machine and no assistant. Those who have domestic duties to attend to generally do sewing work at home. The principal clients of these seamstresses consist of shoe and hat makers and tailor shops which do not own sewing machines themselves.

Two types of sewing machines are used in Nanking, one worked by a handle and the other by a treadle. For ordinary sewing work, the hand-power type is quite sufficient, but the foot-power machine has a far greater speed. Owing to the high cost of living and the depreciation of the copper currency, in which the seamstresses are paid, the charge per piece has advanced considerably during the past two or three years. For sewing a pair of uppers on children's shoes 12-13 coppers is now charged instead of 6 coppers as formerly. The charge for sewing an ordinary Chinese coat was 60-70 cash two or three years ago but has advanced to 10 cents, small money. A much higher charge is made for sewing foreign or semi-foreign style clothing. The daily takings of a Nanking seamstress who devotes her time entirely to the work are estimated at between 1,500 cash and a dollar. The advantage of using the sewing machine has now been fully realised by the Nanking public. The machine not only saves labor and time but also turns out better work. Sewing machine stitches are always more uniform than those made by hand. Between 800 and 900 seamstresses in Nanking are earning their living by this occupation.

The introduction of the hosiery-knitting machine into Nanking has given employment to large numbers of women and girls and greatly improved the economic conditions of the poorer classes. Any one who wishes to engage himself or herself in this occupation must learn the work for one or two months under an expert knitter. During this period of apprenticeship, the beginner not only learns how to knit but also acquires a rudimentary knowledge of how to repair and overhaul the machine. The Nanking Vocational Training School for Girls also teaches hosiery knitting to its pupils. Nanking hosiery knitters either hire themselves to the hosiery knitting establishments on a daily wage basis or do the work at home on their own account. The cheapness of the knitting machine makes it available to most of the Nanking knitters. If the knitter works at home, his output can be sold to either the hosiery knitting establishments or the outfitters and dealers, who sell such articles. If the knitter is enterprising enough, he may employ a man to bring his products directly to the consumer by peddling in the streets. In this case, he can reap more handsome profits. There are only a few well organised hosiery knitting works in Nanking, but a great deal of the work is done by women in their homes. It is estimated that about 700 women in Nanking are engaged in hosiery knitting.

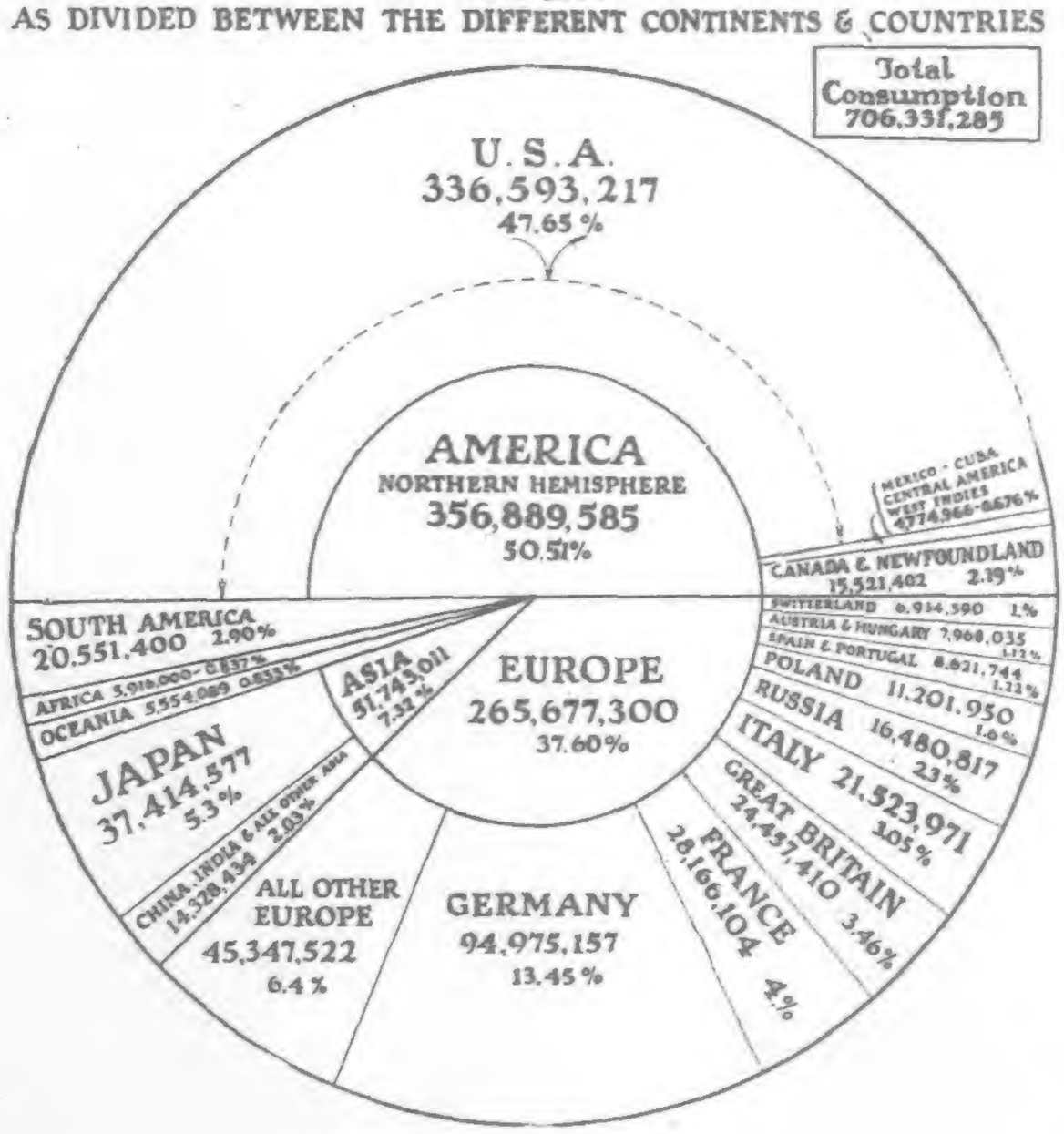
The Electric Incandescent Lamp Business of the World

Francis W. Willcox, General Electric Company

THERE is probably no better index of the electrical development of any country than the consumption of electric lamps in that country. Certainly there is no better measure of a country's *electric lighting* development than the number or value of electric lamps used each year. This has become increasingly apparent with the growth of the electric industry, owing to the almost universal adoption of the incandescent electric lamp. The growth of electric services is rooted in and woven about the development and use of the incandescent electric lamp. It is not too much to say that the lamp is the dominant device and the most potent part of the electric industry as well as the most universally used electric appliance. A review of the world's lamp business for any year should therefore prove interesting and valuable as giving a picture of the relative electrical industrial development of the various countries and areas of the world. A comparison of lamp consumption by years will also show the relative growth of the electric industry in each country.

From a census of the total world's lamp business covering the year 1922, it has been found that the total *production* of lamps (which is also the apparent consumption) amounts to 706,331,000 lamps of all sizes, large and miniature. This is 0.42 lamp each for all the inhabitants of the world, or 0.023 lamp for all of those in areas outside of the United States. It equals 6.2 cents expended by every person a year for lamps, or 5.1 cents per person outside the United States. In the United States there is an apparent average for each person of 3 lamps per year used and 70 cents per year spent for lamps. Of this number some 545,741,000 were the so-called "large" lamps employed in standard lighting service and the remainder, amounting to some 160,590,000, were of the miniature type, as used in the automobile and flashlight, and lamps operating chiefly from batteries.

The division of the world's lamp consumption between countries is clearly shown in the circular chart, or "lamp pie" as it may be termed, on this page. This chart definitely reveals the predominant electrical position of the United States, which consumed 47.65 per cent. of the world's total lamp consumption. This is greater than the whole of Europe, including Great Britain, which consumed altogether only 37.63 per cent. of the world's consumption. Germany forms the largest part (over one-third) of Europe, but the United States consumption is over 3½ times that of Germany. North America, including the United States, Canada, Mexico, Central America, Cuba and the West Indies, takes 50.3 per cent. of the world's consumption, so that with Europe, practically 88 per cent. of the world's consumption is accounted for, leaving only 12 per cent. for the remainder of the world. This 12 per cent. part is sub-divided as shown into 7 per cent. for Asia (of which Japan takes 5.3 per cent.); 2.92 per cent. for all South America; 1.05 per cent. for Oceania including Australia; and 0.86 per cent. for Africa.



Growth in Lamp Consumption in the Past Decade

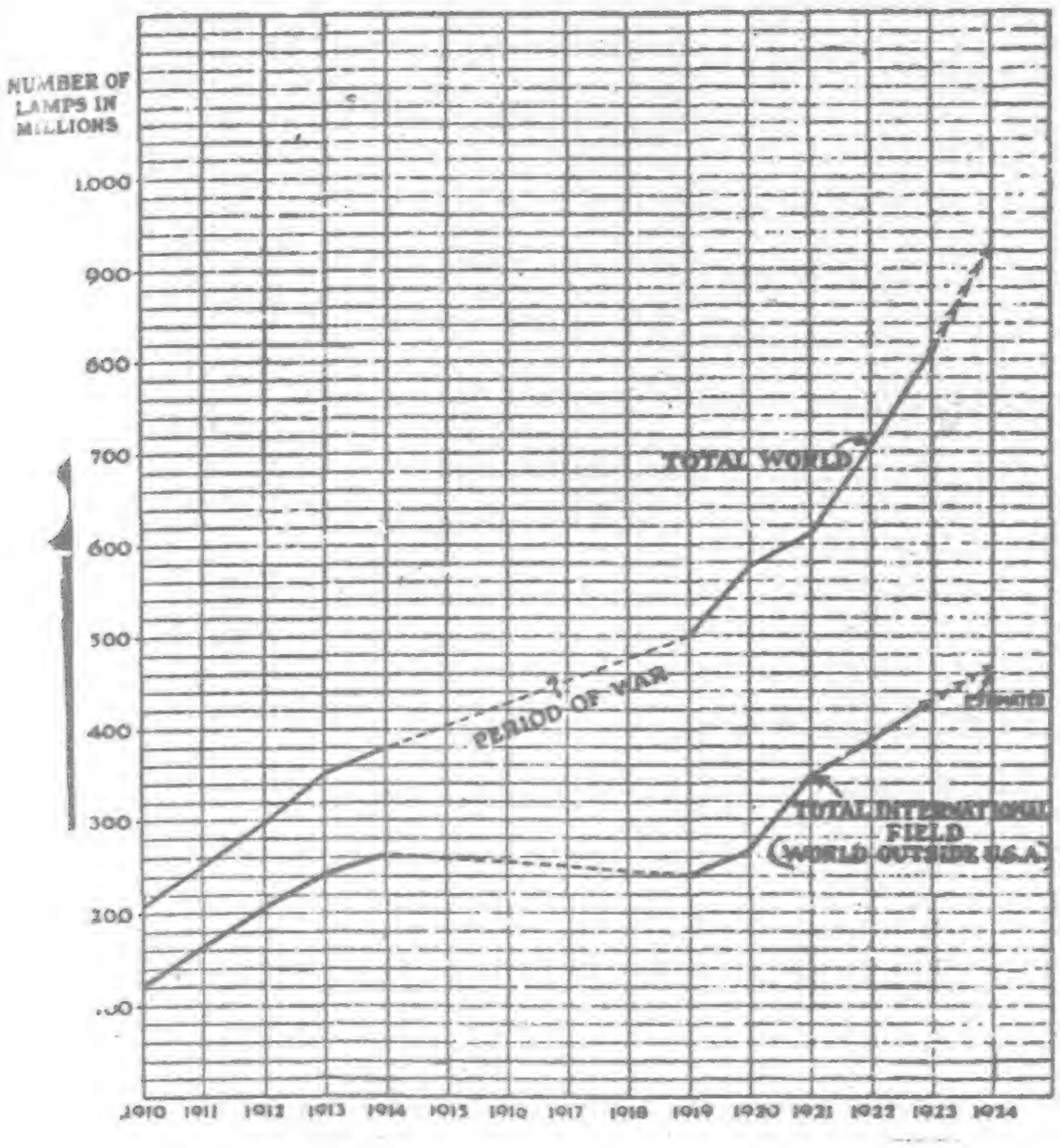
In 1911 a census of the world's lamp production gave an apparent total consumption of 251,503.00. In eleven years then, there has been an increase in annual consumption of 454,828,000 lamps, or over 180 per cent. total growth, or about 6 per cent. growth per year. During the decade, in part of which the World War was waged, the world's annual lamp consumption has grown at an average rate of 41,348,000 lamps per year.

In the same time the lamp consumption of the United States has shown the amazing increase of 250,573,000 lamps, or nearly 300 per cent., a rate of 11 per cent. growth each year. The remainder of the world outside of the United States has increased 196,261,000 lamps in these eleven years, or 113 per cent., a rate of about 5 per cent. growth per year.

Electric lighting in the United States has therefore apparently grown at more than double the rate of the remainder of the world in the past decade. In 1911 the United States consumed 35 per cent. of the world's total lamp consumption, while in 1922 the United States portion had advanced to 47.65 per cent. Europe in 1911 consumed 55 per cent. of the world's total as compared with 36.7 in 1922. Great Britain in 1911 consumed 8 per cent. as compared with 3½ per cent. in 1922. Germany in 1911 took 12½ per cent. as compared with 13½ per cent. in 1922. Japan in 1911 took 1½ per cent. of the world's total and in 1922 she consumed 5.3 per cent. These are a few typical examples.

Per Capita Lamp Consumption of Leading Countries

The table below gives the percentage increase in total lamp consumption and in lamp consumption *per capita*, for the principal countries and areas of the world. It shows extremes of growth from that of Great Britain of only 23 per cent. to that of 405 per cent. for Japan, while intermediate positions are occupied by Germany, with a growth of 200 per cent., and the United States with an increase of 291 per cent.



Increase of annual lamp consumption for the principal countries and areas of the world, in periods of 11 years—1911 to 1922.

Countries and Areas	Per Cent. Increase in Number of Lamps Consumed	Per Cent. Increase in Per Capita Consumption
Belgium...	68	60
France	70	67
Germany	200	220
Great Britain	23	17.6
Italy	95	60
Netherlands	170	93
Spain and Portugal	40	14
Sweden	97	81
Switzerland	56	49
Total for Europe ...	96	49
Japan	405	114
United States	291	227
Total for World outside the United States ...	113	
Total for the world	180	

The best basis for consumption between countries is undoubtedly the annual per capita consumption. These are shown in the following diagram for various countries and areas. Comparing these values with those for 1911, we have the percentage changes shown in the third column of the above table.

The annual per capita consumption of lamps for 1922 in most of the countries is less than one lamp. The exceptions are notable and include the United States, Germany, Canada, Switzerland, Norway and Sweden. The last four countries have large water power resources, while the United States and Germany are countries having great industrial development. The comparatively low consumption for Great Britain is due to its having relatively few houses wired and to its firmly entrenched gas service.

Per Capita Consumption

The high *per capita* lamp consumption for the United States is the result of the intensive electric lighting development work on the part of electrical manufacturers, central stations, and the electrical trade generally in the United States for the past ten years or more. Such work has been ably assisted and co-ordinated under the National Electric Light Association, the Society for Electrical Development, and the Illuminating Engineering Society.

The present United States figure of over three lamps *per capita* is only a recent achievement and is several fold greater than what it was in 1910. It has been accomplished only as a result of unremitting endeavor and large expenditures of money and effort in the extension of electric service and the promotion of more and better lighting. A striking example of such activities is the Children's Home Lighting contest held at the end of 1924 on which and in connection with which the manufacturers, central stations, and electrical trade in general expended several million dollars, the original promotion and development fund alone approximating half a million dollars.

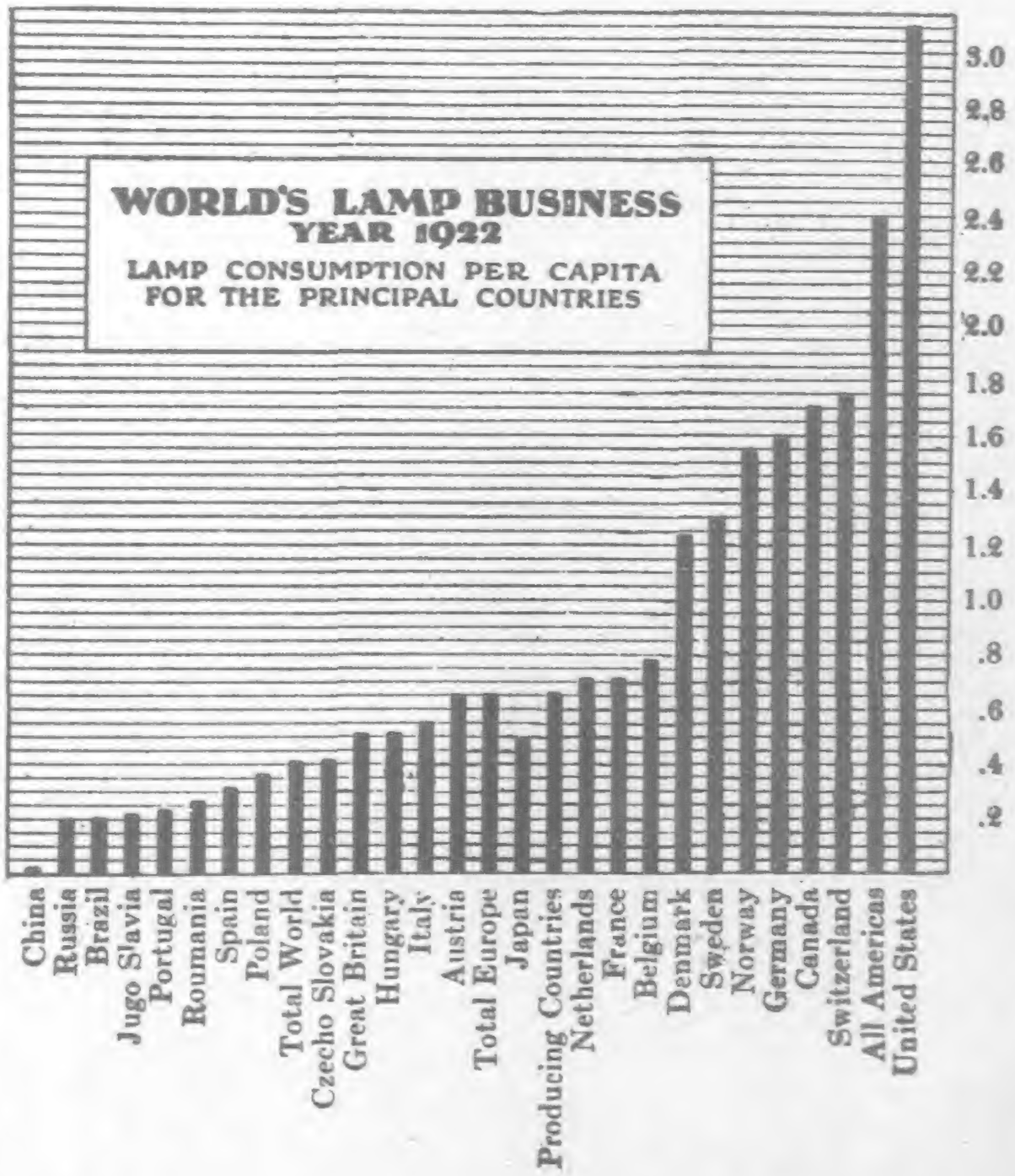
The results secured in lamp consumption for the United States may well serve to stimulate the electrical industry in other countries to promote electrical development.

World Possibilities in Electrical Lamp Use and Consumption

It is an interesting speculation to consider what might be achieved were the lamp consumption of the leading countries of the world raised to the 1922 per capita figure for the United States or even to one-half this figure.

It would mean for European countries alone an increase from the present total of 257,342,000 lamps to the enormous total of 1,170,000,000. For Great Britain alone it would raise the existing total consumption of 24,457,000 to a total of 142,000,000 lamps. Taking the whole world, after excluding the United States, and leaving out such countries as Asia (except Japan), and central Africa, with their enormous masses of population unserved with electric light, we would find that just raising the lamp consumption to one lamp per head (one-third of the consumption ratio of the United States) would give a total consumption of over 681,000,000 lamps or about twice the existing demand. If the consumption were raised to two lamps per head of population (two-thirds of the United States consumption ratio), this would give a total lamp consumption of over one and a third billion lamps or about four-fold increase on the present consumption. Such a lamp demand at an average price of the equivalent of 30 cents each would give a value corresponding to $409,000,000 at two lamps *per capita*.

We can expand this idea still further on the basis that a lamp consumed each year means, on an average, at least two sockets and lamps installed. We can then readily visualize what these enlarged lamp consumptions of 681,000,000 and 1,363,000,000 lamps per year



would mean in kilowatt-hour demand on central stations, and in the sale of such things as sockets, switches, wire, lighting fixtures, and other appliances, of meters, transformers, cable, conduits, and of the generating apparatus required.

A lamp consumption of 1,363,000,000 would represent about two and three-quarter billion sockets and lamps installed, and this at an average of only 50 watts per lamp gives an installed lamp capacity of 136,000,000,000 watts or 136,000,000 kilowatts. With an average use per lamp of 500 hours per annum, the annual kilowatt-hour consumption for lighting would total 68,000,000,000, representing, at the equivalent of 5 cents per kilowatt-hour, an annual revenge corresponding to nearly three and a half billions of dollars.

It has been conservatively estimated that every lamp or lamp socket newly installed calls on the average for an investment in sockets, lighting appliances, meters, cable, distribution equipment, and generating apparatus of about nine dollars for every dollar expended in lamps.

Assuming that the lamp costs represent an average of 30 cents each, then the total investment cost for the lamps, lighting fixtures and appliances, and distribution and generating equipment would be the equivalent of about three dollars per lamp. Taking his figure, our enlarged lamp consumption at a ratio of a lamps *per capita*, which calls for a 1,363,000,000 lamp and socket installation, would represent a purchase and investment equivalent to $4,089,000,000 of electric appliances and apparatus, including lamps.

Such is the tremendous return that waits the electric industry of the world as the result of the development in those countries (outside of the United States and the undeveloped world areas of India, China, Africa, etc.), of an electric lamp consumption of two lamps per head of population or less than two-thirds of the figure already obtained in the United States.

Trend of the World's Lamp Consumption

The trend of the world's lamp consumption is interestingly shown by the curve below. It predicates a total world's lamp consumption in 1924 of over nine hundred million lamps. The comparison trend curve excluding the United States is shown on the same diagram and indicates a consumption in 1924 of about half of that of the whole world.

20-ton Clear-Ice Plant at Kyoto

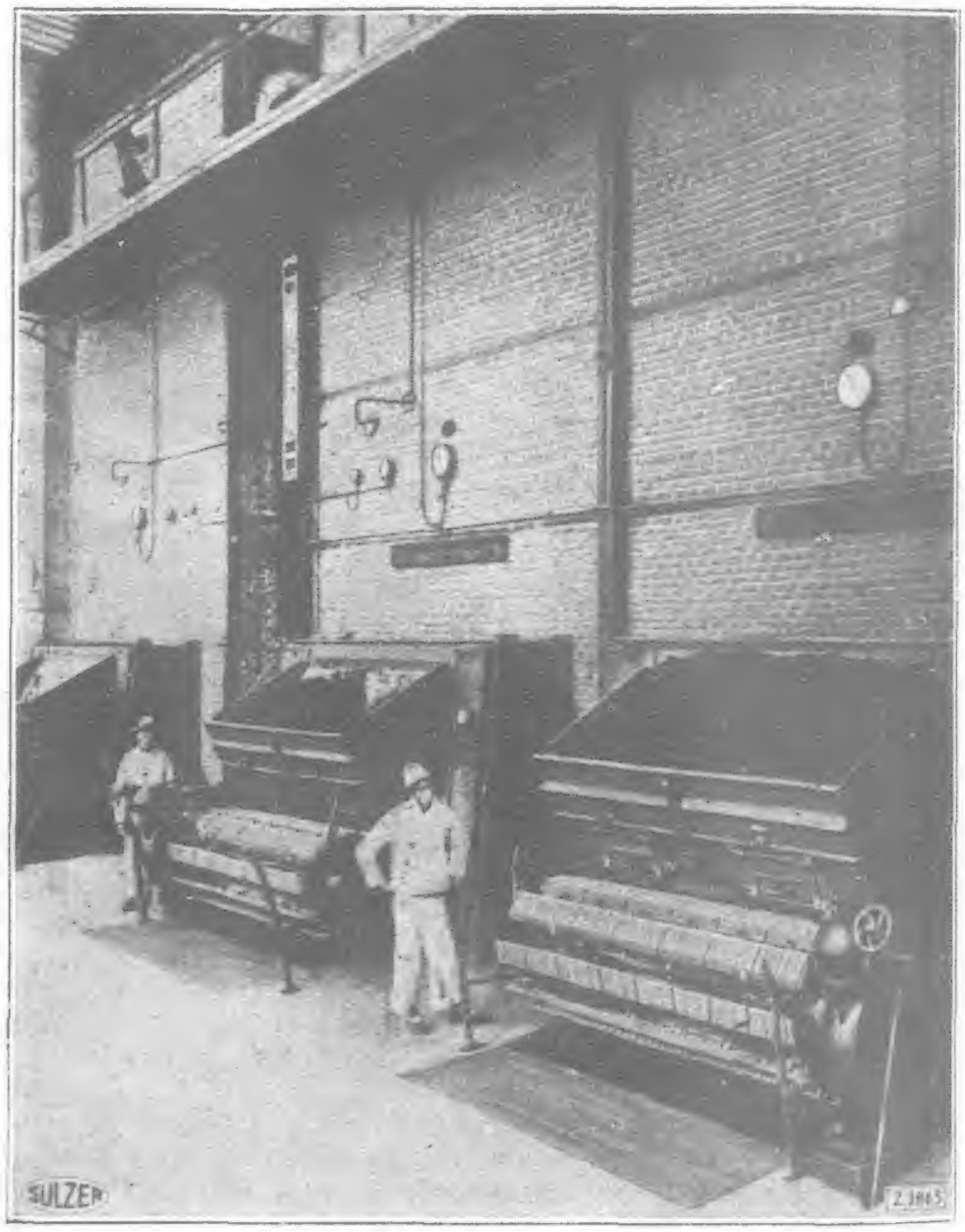
For the Ryumon Hyoshitsu, Kyoto, a company possessing a large number of ice factories distributed throughout the whole of Japan, a clear-ice plant has been supplied by Sulzer Brothers,

20 ton Ice Plant for Ryomun Hyoshitsu, Kyoto (Japan), two 300 lbs. Ice Cans being placed in Tipping Device.

designed to produce 20 tons of ice daily. The cold is generated by Sulzer ammonia compressor with a rated capacity of 480,000 h. Th. u. per hour, belt driven from a 65-h.p. electric motor. The ice tank is fitted with mechanism for agitating the brine and contains 384 cells for 300-lb. ice blocks. The water with which the cells are filled is taken from the city mains, whilst the cooling-water for the trickling condenser is raised from an artesian well 330-500-ft. deep and delivered to the condenser by a Sulzer centrifugal pump. The ice made in winter and early spring is kept in store house with a capacity of 1000 tons, erected alongside the machine room.

Sulzer Upright Water-Tube Boiler Plant in China

The Nikka Boshoku Kaisha, an important firm of cotton spinners in Shanghai, has put in service in their Pootung Factory, Shanghai, a boiler plant for supplying the steam required by the electric power station. The plant consists of three Sulzer upright water-tube boilers, each of 2,700 sq. ft. heating surface and built for a working pressure of 215-lb. per sq. in. The superheaters fitted to the boilers can be cut out of service altogether or used at various adjustable temperatures making it possible to superheat the steam up to abt. 660 deg. Fahr. The stokers are travelling



Sulzer upright water-tube boilers in a spinning mill at Shanghai, China

stokers of the Underfeed Stoker Company's type working with forced draught. Each of the boilers can evaporate 14,500 to 15,500-lb. of water per hour in normal service, and 19,000 to 21,000-lb. per hour when forced. Chinese or Japanese coal is used as fuel. In addition to the boilers and their accessories, Sulzer Brothers supplied all the steam and water piping and the necessary auxiliary machinery, such as high-pressure centrifugal feed-pumps and forced-draught fans.

In a report dated March 5, 1924, the engineer of the factory says that, as this was the first Sulzer upright water-tube boiler in Shanghai, he was anxious as to whether he would get good results or not; but now he is much satisfied to find a much better economy than guaranteed and no difficulty in handling even with Chinese labor.

Iron in the Philippines

By Warren D. Smith

THERE were nearly 20,000 metric tons of iron ore mined in 1919. The production for 1920 fell considerably below this, amounting to only 116 tons. The reason for the decreased production is that the Calambayanga deposits, which previous to 1920 had been mined by Japanese interests, lay idle. The specific reasons for the cessation of operations have not been learned, but it is to be presumed that the falling market and the wharfage tax (which is virtually an export tax) of 2 pesos per ton made the mining of this ore prohibitive. At the present time the only production is in the Angat district, Bulacan Province, where 83 metric tons of pig iron were made during 1920 from the high-grade hematite of that region. The production is entirely in the hands of Filipinos who are using the very crude, but very cheap, methods of the Chinese. The product is of such high grade, owing to the excellence of the ore and the use of charcoal, that plowshares cast from this material are prized above even imported steel plows. Pratt and Dalburg, who made a thorough study of this region in 1912, estimated its probable iron-ore reserve at 1,200,000 tons.

On Dahikan Bay, Surigao Province, Mindanao, there is what appears to be an enormous deposit of lateritic iron ore, which in many ways resembles the Cuban deposits at Nipe Bay. Pratt and Lednicky, who surveyed the Surigao deposits in 1915, estimated the iron-ore reserve in this field to be 500,000,000 tons. This deposit was made a Government reservation by an executive order of the Governor General in 1915, and it is this which the recently created National Iron Company intends to exploit. If the deposit is worked, the logical place for the smelting operations is Cebu Island, as the only good seam of coking coal known in the Island is in Cebu, and the rule the world over is that iron goes to coal. Cebu has other advantages to recommend it as a smelting point; namely, it has the largest supply of labor and it is favorably situated, geographically and commercially.

The importance of iron in the present stage of civilization needs no emphasis here. In the Philippines this need has only lately begun to be felt; it came with the quickening and revolutionizing of the industrial life of the Archipelago. Until 1898, when the aspect of things in general changed, agriculture was the chief industry of the Filipinos and it will continue to be; but manufacturing, as the natural outgrowth of a modernized mode of life and of improved agricultural practice, is on the increase.

As is generally known, iron metal does not, except under rare and special circumstances, exist in the natural state in the earth. Practically the only natural metallic iron is in the form of meteorites. As these are relatively few in the Philippines, as elsewhere, it becomes necessary to turn to the compounds of iron for a supply, of which apparently there is great abundance. The important Philippine iron minerals are hematite (Fe_2O_3), magnetite (Fe_3O_4), and limonite ($2\ Fe_2O_3.3\ H_2O$). These three minerals make up the bulk of the iron-ore deposits in the Philippines. They are generally bedded or blanket deposits, though magnetite is found in some fields in the form of veins.

The principal deposits are the Angat deposits, Bulacan Province, and the eastern cordillera, Luzon; the Mambulao deposits, Camarines Norte Province, Luzon; and the Surigao deposits, northeastern Mindanao.

For the geologic discussion of this subject I have drawn freely upon the work of McCaskey, Adams, Pratt, and Dalburg, especially. Elicano has contributed the metallurgical discussion.

The Angat deposits.—These deposits were first investigated and mapped in 1903 by McCaskey. Dalburg and Pratt say:

> The Bulacan iron-ore region lies in the foothills of the eastern cordillera about 15 kilometers east of the towns of Angat and San Miguel, Bulacan Province. The region has its major extension in a northeast direction. Numerous isolated outcrops are found for a distance of 20 kilometers along this line, over a width of about 2 kilometers, and two small outcrops occur to the east of this general belt.
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> The ores are found near the contact of the igneous rocks, both holocrystalline deep-seated rocks (granites) and intrusives and extrusives which form the cordillera, with the sedimentaries lying more or less tilted on its western flank. The strike of the sedimentary formation is roughly parallel to the line of contact with the igneous rocks. The upper beds are tuffs, clays, and sands of Pleistocene to Recent age, while the lower part of the series is made up of the shales, sandstones, and arkoses which Smith assigns to the Miocene and Oligocene. The limestone horizons which have been noted generally in the Tertiary rocks are identified in this series, and at several places there is an apparent association of the ore deposits and the lower limestone (Miocene).
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> The ores are essentially hematite and magnetite. These minerals occur as intimate mixtures in all proportions from pure magnetite to pure hematite, although hematite is more commonly encountered. The ores are usually fine grained and massive, but the hematite is sometimes "micaceous." The hematite ores are hard and dense, while the magnetite and the typical hematite magnetite ores are softer. Quartz is prominent in most of the ore; it generally occurs filling interstices between the iron minerals, but considerable vein quartz carrying only minor quantities of crystalline hematite and magnetite is to be observed. Great bowlders and blocks of iron-stained quartz mask the immediate neighborhood of the ore bodies. The quartz in these bowlders is evidently the product of the replacement of other rocks by silica. The walls of the shallow pits from which the iron ore is mined are in many instances a soft, dark green rock, which consists largely of hornblendic mineral, sometimes fibrous, but usually massive. It is probable that this rock is in some degree analogous to the complex silicates which are characteristic of some of the Scandinavian iron ores and to which the name "skarn" has been applied by the Swedish geologists. The association of the ore with this wall rock is so general that the native miners recognize the latter as *camisa de bacal* (cloak of the iron ore). Pyrite is characteristic of the ores, and occurs in them as aggregates of fresh crystals or massive in veinlets. Chalcopyrite sometimes accompanies the pyrite, and cobalt has been detected in these sulphides.
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> Analyses show the ores smelted in the native industry to average 60 per cent. or more of metallic iron. The ore is hand picked for smelting, however, and since the miners are very clever at judging rich ore the smelting charges represent better than the average ore. Samples made up of spalls from many bowlders on the outcrops indicate that the larger ore bodies carry on an average from 50 to 55 per cent. of metallic iron. The typical ore is of Bessemer grade although in some of the ores the phosphorous content is about the usually prescribed limit; sulphur is generally low. In the purer ores the percentage of alumina (from 2 to 6 per cent.) is rather high in proportion to the silica (from 3 to 8 per cent). Alumina and silica are the principal slag-forming constituents of the ores.
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> *Camaching.*—The iron-ore deposit in the locality called Camaching at the head of Balaong River lies about 20 kilometers north-northeast of Angat. Camaching is the northernmost of the iron-ore properties in the Angat district and is also the most difficulty accessible property. There is displayed at Camaching, however, a tonnage of iron ore greater than that of all the other properties combined.
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> Magnetite is the principal ore mineral, but is intimately mixed with black massive hematite.
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> *Montamorong.*—Montamorong lies about 7 kilometers south-southwest of Camaching. It is nearer the western edge of the cordilera than Camaching, and is, consequently, more accessible. The ore deposit at Montamorong occurs at the eastern edge of the granite area on the contact between the granite and extrusive rocks—flows and tuffs. Numerous dikes of a dark-colored holocrystalline rock made up principally of plagioclase feldspar and pyroxene cut both she granite and the extrusives in the vicinity of the ore body. The ore body has the appearance of a vein with much-altered and not sharply defined walls. A shallow pit which has been opened on the outcrop reveals the presence of a fault parallel to the apparent strike of the vein (north 60° west) with a downthrow of about 1 meter to the northeast. The vein pitches to the northeast at an angle of 45° at the site of the pit, but it is doubtful if the strike and pitch, as noted, are constant. The workable ore in the vein has an estimated thickness of from 1 to 2 meters, and the outcrop can be followed for 50 meters.
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> The ore is a soft massive hematite with a considerable quantity of magnetite.
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> *Hison.*—The original Hison concession, the demarcation for which was performed in 1816, apparently centered around the middle one of three outcrops which occur about 3 kilometers south-southeast of Montamorong.
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> These outcrops lie along the eastern border of the granite area. Immediately east of the Hison outcrop is a narrow belt of sedimentary rocks, consisting of limestone, shales, clays, and fine-granied clastic rocks. The limestone is most prominent, and persists southward beyond the Santa Lutgarda outcrop. The beds strike north 20° east, and dip eastward at an angle of 60°. As at Montamorong the periphery of the granite is cut by dikes which appear to penetrate the sedimentaries as well. Although detailed relationships cannot be determined, in a general way the Hison ore deposit occurs between a basement of granite and overlying sedimentaries and is associated with the dike rocks.
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> At Hison and Santa Lutgarda the ore is identical; at the surface, a massive hard black ore consisting of both hematite and magnetite, while in the shallow pits which have been opened the ore encountered becomes softer and consists almost exclusively of magnetite. Smelting charges carry 65 per cent. of metallic iron. Gangue minerals are quartz, pyrite, and the minerals of the characteristic green rock which is found in and near the walls.

At the Constancia outcrop the ore is similar, but carries less quartz and a larger proportion of the green wall rock, which here is lighter than usual in color and decidedly fibrous. The Constancia ore is principally magnetite with subordinate black hematite. It is soft, and is marked by nests and veinlets of pyrite. Here, as elsewhere, the pyrite is most prominent near the walls of the deposit.

In the bowlders which mark these outcrops, several thousand tons of ore are available. The width of the ore exposed in the outcrops varies from 6 to 15 meters, but it cannot be assumed that the deposit is continuous between outcrops.

Santol.—Two mining claims located by American prospectors cover the base of Mount Santol along Santol Creek about 3 kilometers south-southwest of Hison. No outcrops of ore in place are to be seen, but the claims are strewn with large hematite-magnetite bowlders aggregating undoubtedly several thousand tons of ore.

The inevitable and intimate association of the ores with vein quartz and the character of this association suggest that the ore minerals, hematite and magnetite, were deposited together from solutions presumably of more or less deep-seated origin. Part of the pyrite occupies cracks in the original ore and must, therefore, be secondary, but pyrite and rarely chalcopyrite also occur in intimate mixture with the ore minerals apparently as original constituents of the ore. Much of the ore appears to be a product of replacement; specimens showing the replacement of limestone, fragmental rocks, felsites, and holocrystalline rocks by ore have been noted. The green wall rocks, which have been cited as comparable with the "skarn" of the Norwegian iron-ore deposits, are believed to be an alteration product resulting from the action of the ore-depositing solutions.

The principal ore deposits occur near contact between sedimentary and older igneous rocks, both deep seated and effusive. The strike of the contact between the igneous rocks and the sedimentaries, which is in general paralle to the strike of the sedimentary rocks, is also the strike of the larger ore bodies. The possible conclusion from this fact that the ore has resulted from contact phenomena between the two types of rocks is not tenable, however, because the igneous rocks are not intrusive, but constitute a preexisting basement.

From the foregoing discussion it will appear that a minimum of 1,000,000 tons of iron ore is probably available in this field. This approximation is made in the absence of any direct information as to the persistence of the ore with depth, and is therefore not to be accepted as a reliable estimate. If the deposit is purely superficial, as it may well be, so far as the evidence from exploration is concerned, then the estimate is too large. From the geology of the deposits as presented in this paper, however, it may be argued that the persistence of the ore to a reasonable depth is probable, and if the ores do persist in depth a great deal more than 1,000,000 tons should be in reserve in this field.

Other observers have suggested that the Bulacan iron ores have resulted from the alteration of pyrite and other iron-bearing minerals by surface waters. Such an alteration would be most complete at the surface; therefore, the ore might be expected to become more pyritiferous with depth and to be unfit for use when the unchanged sulphides were reached. A deep seated origin, such as is suggested in the foregoing discussion, with the pyrite secondary or at most contemporaneous in origin with the ore minerals, would mean more constancy in character with depth and a more or less uniform distribution of pyrite.

It would not be difficult nor expensive to explore the Bulacan iron-ore deposits by core drilling and thus to determine their character and extent beneath the surface.

My own opinion of these deposits of the eastern cordillera is that they are largely of superficial origin, and core drilling must absolutely precede any large-scale operations. I am the person alluded to by Pratt as having a different opinion as to the origin of these deposits, but owing to Pratt's longer study of these, I would not here press my own ideas.

The Lanatin iron deposits.—I have never visited these, but suspect they are a continuation of those just described, as the axis of the folding in the eastern cordillera, if projected, would pass through the three localities Bosoboso, San Isidro, and Santa Inez. Of these Adams says:

> In visiting the Lanatin deposits the writer journeyed by the way of Bosoboso, past the deserted settlements of San Jose, San Isidro, and Santa Inez. At Santa Inez there are small bowlders of iron ore in the river, and the remains of the abutments of a suspension bridge are in part constructed of bowlders of iron ore. Bowlders of iron ore, some of which are from 2 to 3 meters in diameter, are encountered about one hour's walk up the river in the bed of the stream. The mountain to the west of the river was evidently the source of these masses. The lower slope of the mountain was ascended along the bed of a stream which empties into the river just above the bowlders. The country rock exposed by erosion is an andesite containing numerous small specks of pyrite, and in some places bunches of pyrite were found in sheer zones. The larger masses of pyrite were partially altered to hematite. In places there is a small amount of chalcopyrite present and the alteration has given rise to a coating of the blue and green copper carbonates. The copper ores have been prospected lately, but have not been found in encouraging quantities. On the wall of the ravine, a face of rock was seen which showed a considerable amount of iron ore, coating and replacing the country rock. This has somewhat the appearance of a dyke running up the mountain, although there is no proof that it is, since the dense vegetation obscures the formation excepting in the walls and bed of the ravine. Near the top of the hill there is an outcrop of iron ore. The summit of the hill is capped by a heavy bed of limestone such as is frequently met with in the eastern cordillera. In descending, exposures of a metamorphosed fine-grained clastic rock were seen in the bed of the ravine to the south of the one which was followed in ascending. This rock contains specks of pyrite, but no bowlders of hematite were seen. A simple and sufficient explanation of the origin of the iron ore is that it has been derived from the pyrite which is found disseminated in the country rock and occurring as masses in the sheer zones. It is probable that the mineralization is a result of contact phenomena resulting from the intrusion of the andesite in the sedimentary formation.
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> The amount of iron ore is sufficient to supply a small furnace operating as a local industry, and utilizing charcoal in smelting, but there is at present no exposure of an ore body which would warrant the establishment of a large furnace.
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> It should be remarked here that the prospectors who examined this locality report another iron deposit somewhat more promising at a distance of a long day's march in the rugged and very little known country to the northeast.

Iron deposits near Santa Inez.—A deposit of iron which has never been worked occurs a short distance to the north of Santa Maria, in the valley of the Santa Maria River which enters the northeast arm of Bay Lake. The position of this deposit is shown on d'Almonte's map of Luzon, and to the south of it there is indicated an outcrop of coal. From inquiry it was learned, that neither the coal nor the iron is of sufficient importance to warrant special investigation.

The Camarines deposits.—The Camarines iron deposits are three in number and are in the following localities: Calambayanga Island, a small island on the west side of the entrance to Mambulao Bay, Camarines Norte; on the long narrow neck of mainland on the west side of Mambulao Bay; and near the barrio of Batobalani near the head of Paracale River, a few kilometers southeast of Mambulao.

I have visited all of these deposits recently (1920) and have had opportunity to confirm the surveys made there by Pratt in 1915, and, rather than recast what that author has written, I will include excerpts from his reports made about that time. Subsequent work makes it appear that not so much ore will be found available here as Pratt thought at that time to be likely. Only the judicious use of the core drill will absolutely prove these deposits. It should be pointed out, in justice to Pratt, however, that he gave no estimate of probable tonnage other than is contained in the statement that "the ore in sight is undoubtedly to be estimated in hundreds of thousands of tons but the total quantity of ore available is undetermined."

Excerpts from Pratt's paper are as follows:

> The ore body on Calambayanga Island appears to be irregular in shape, but to conform more or less closely to the strike and dip of the sedimentary beds in which it occurs. It outcrops on the western part of the island and is roughly oval or lens-shaped in plan. Ore of exactly the same character is encountered on the mainland to the south, where exposures are seen at intervals for a distance of at least 2 kilometers (1.2 miles) inland. A small island south-southwest of Calambayanga Island and considerably to the west of a line between it and the outcrops on the mainland is composed wholly of iron ore of the same character. Again, at Bato-balani, 12 kilometers (7.5 miles) southeast of Calambayanga Island and still near the line of contact between the sedimentaries and the older igneous rocks, iron ore similar in character to the Calambayanga ore is found.
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> At each of these places the outcrops are marked by great blocks of black ore, angular in form and with pitted, irregular surfaces. These blocks have been designated as bowlders by several observers, but the term bowlder conveys a wrong impression, inasmuch as the masses of ore at the outcrops show no evidence of having been transported, but have the appearance of disintegration products in place. They vary in size up to masses of many ton's weight. At the prominent outcrops they occur to the exclusion of all other rocks, but elsewhere they are isolated from each other and are embedded in yellow, residual clay.
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> Only the Calambayanga ore body has been examined closely by me. The western half of the island is strewn with blocks of ore. The northeastern part is made up of sedimentary rocks, principally sandstones, or fine-grained clastics, shales, and conglomerates. At the northern extremity of the island the beds strike north 20° east and dip 45° to the west, but toward the south, along the east coast, the strike changes gradually until it is north 60° west with the dip to the south. A bed of crystalline limestone outcrops in the sedimentaries halfway along the eastern coast, and some of the other sedimentary beds are calcareous. Minor outcrops of stratified rocks are found on the eastern coast, but here the strike is north 60° west, and tuffs, agglomerates, and fragmental rocks predominate over other types. These volcanic rocks are less indurated than the sedimentaries on the eastern shore of the island, and there is a consequent suggestion that they belong to a separate younger formation.
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> Extending north-northwest into the mass of the island from the southeastern point is a great outstanding body of quartz, a lode or vein, with a width of possibly 100 meters. This quartz is mineralized and contains numerous veinlets of iron ore. A shallow pit has been sunk in the quartz near the centre of the island, and a sample taken from the wall of this pit showed upon assay a trace of gold. The sedimentary rocks to the east are highly silicified near the contact with the quartz.
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> The outcrop of the quartz becomes concealed toward the north-northwest by a mantle of clay, but on the northwest shore, approximately at the point where the quartz should reappear, if it continued so far, there is encountered a dike of dark-colored gabbro between agglomeratic tuff and sedimentaries. This dike is vertical and strikes north 60° west. A small vein of quartz carrying unaltered fresh pyrite was observed in it. Under the microscope the dike rock is seen to be holocrystalline and to consist principally of plagioclase feldspar and pyroxene. The feldspar predominates and occurs in large

lath-shaped crystals with a parallel arrangement. The pyroxene appears to be much decomposed, and associated with it throughout the section is magnetite in considerable abundance.

Along the western and northern shore line of the island the blocks of iron ore are present in great abundance and lie one upon another with no intervening foreign material. Farther up the slopes, however, and at the summit of the island the blocks are scattered over the surface, embedded in residual clay.

Fanning studied the ore on the mainland; he traced the outcrop of the ore for a total distance of 3 kilometers (including the outcrop on the island ?) The width as revealed to him by occasional outcrops in place varied up to 15 meters. Sedimentary rocks are found on the mainland, as on the island, and similarly are indurated, tilted at various angles, and pierced by dikes. Volcanic tuffs, agglomerates, and flows are prominent on the mainland and on the neighboring small islands.

At Bato-balani the iron ore occurs in large blocks scattered over the side of a hill. The ore is magnetite with some hematite and carries also fresh quartz and pyrite.

The iron ore on Calambayanga Island and on the adjacent mainland is almost pure hematite with only traces of magnetite. The hematite is massive or granular, and the ore is moderately soft and very porous, or vesicular. At places over the exposure a small proportion of pyrite in fresh crystals may be detected in the hematite, and likewise quartz is found sparingly in scattered grains or in veinlets. Copper stains were found in the slightly pyritiferous ore at two places, indicating that some chalcopyrite occurs with the pyrite.

The Bato-balani ore contains much more magnetite than the ore on Calambayanga Island; it is also harder and shows more pyrite and quartz, but otherwise the ores similar.

The observations set forth in this report have led to the conclusion that the ore on Calambayanga Island is related in origin to the quartz vein or lode with which it is associated. Veinlets of ore are found in the quartz, and quartz occurs sparingly in the ore. The processes which produced the body of quartz probably yielded under different local conditions the adjacent body of iron ore. Both types of mineralization probably resulted directly or indirectly from the intrusion of dikes into the sedimentary rocks near the contact with the older igneous base. Apparently there was some replacement of the wall rocks as well as the filling of cavities and fractures. Probably the limestone and the calcareous sediments were most susceptible of replacement in this manner. The dike of gabbro on the north-western shore of the island with its notable proportion of magnetite may be taken to represent a part of the intrusive rocks. The tuff and agglomerate on the shore of the island and on the neighboring islands and mainland are surface extrusions which may be related genetically to the dike rocks.

Rinne concluded that the Bato-balani ore had resulted from contact mineralization, probably at the contact of intrusive diorite and limestone. The Bato-balani and Calambayanga ore deposits prove upon examination to be very much alike except that magnetite is the predominant ore mineral at Bato-balani, whereas hematite predominates at Calambayanga. Probably the two deposits are related in origin, and certainly the observations recorded herewith on the Calambayanga deposit are evidence of a genesis similar to that suggested by Rinne for the ore at Bato-balani.

Certain general characteristics are common to the iron ore at Calambayanga, at Bato-balani, and in Bulacan Province: for example, the association of the ore with intrusive rocks in sedimentaries, especially limestones; the nature of the ore minerals; and the presence of quartz in the ore. In some of the Bulacan deposits the replacement of limestone by ore is clearly evident.

The Surigao deposits.—These deposits were discovered by H. F. Cameron, former district engineer in the Bureau of Public Works, Philippine Government, about 1912. They are situated near Dahikan Bay in the extreme northeast corner of Surigao Province, Mindanao Island. He was struck by the similarity to the Nipe Bay deposits of Cuba with which he was familiar. Samples analyzed by the Bureau of Science, which he had collected, confirmed his opinions about the value of the deposits, and, following his official report, the deposit was reserved by executive order pending a detailed examination. In the early part of 1915 Pratt (504) and Lednicky made a fairly detailed examination of the deposit; excerpts from their report will be found in the chapter on Regional Geology devoted to Mindanao and Sulu.

It is extremely probable that other, similar lateritic deposits will be found in the Philippines as in other parts of Malaysia. Only recently word has come that a large deposit, much like the Philippine, has been discovered in Celebes, just to the south of the Archipelago, and investigations by Dutch engineers with the view to its exploitation are under way.

In many other parts of the Philippine Islands there are considerable accumulations of magnetic sands which have been washed out of the igneous rocks, principally andesite and basalt, and subsequently concentrated on the beaches. In some places these deposits are so extensive as to lead one to consider them as possible sources of iron. In fact, some persons have made serious attempts to briquet and smelt the sands from the beaches of Manila Bay, in Bataan Province, but without success. In Cebu and other islands some specimens of specular hematite have been found, indicating possibilities to be investigated.

Iron Smelting in the Philippines

Dalburg and Pratt have the following to say regarding the primitive method of iron smelting used in the Philippines:

Iron smelting in the Philippines between the years 1784 and 1797 appears from the scant description on the record to have accomplished first a reduction of the iron into balls (bolas) or pasty masses which must have been somewhat malleable since bolos and other implements were made from them. The first smelting was undoubtedly done under the guidance of Spaniards, and can scarcely be spoken of as a Filipino process.

The present-day process and practice have been described accurately and in detail by McCaskey and by Dalburg and Pratt, and have not changed materially within the last fifty or sixty years. An abstract is given in the following paragraphs.

The furnaces are cylindrical stacks from 2 to 2.5 meters in height and about 1.5 meters in exterior diameter. The upper part of the stack to a depth of 1.75 meters is hollow and constitutes the smelting crucible, which is shaped like an inverted truncated cone, circular at the top of the furnace, with a diameter of about 1 meter, and elliptical at the bottom or truncated section of the cone with about 0.5 and 0.2 meter as major and minor axes, respectively. A rectangular runner about 12 centimeters deep and 13 centimeters wide pierces the bottom of the crucible from front to back of the furnace. The back end of the runner admits a single tubular clay tuyèré, which is connected to the blowing apparatus and through which the blast enters the furnace. The front end of the runner, which is placed a little lower than the rear, serves as a tap hole for both iron and slag. A block of quartz-sandstone, locally called *batong-buga*, is set in the wall of the crucible over the tap hole just where the blast, entering through the tuyèré from the opposite side, will impinge upon it. The walls of the furnace are soft-burned brick made of clay and set in a mortar of the same clay, which is the residual resulting from the decomposition of the granite found in the region. The sides of the crucible and runner are lined with a mixture of clay and charcoal powder.

The blowing apparatus (*joncoy*) is a hollow log 35 centimeters in interior diameter and 3.5 meters long; it is fitted with a wooden piston which is edged with soft chicken feathers to prevent leakage of air around it. The piston rod is long enough to permit a full stroke when worked back and forth by hand. The blower is double acting, wooden tubes conducting the blast from valves at both ends of the displacement chamber to the tuyèré. In operation the blower lies almost horizontal, one end being raised slightly from the floor to facilitate the work of the operator.

The molds (*hormas*) are made of clay reënforced by rattan or wire. Each mold consists of a base, which is fixed rigidly to a frame or rack, and a removable cover, which is made securely fast to the base by a stick placed across the top of the molds with both ends tied to the rack. For convenience in pouring one end of the rack is raised so that the molds are inclined at an angle of about forty degrees.

The fuel used in smelting is charcoal, usually burned near the smelting plant. A charcoal kiln or an *inglesa* is a rectangular inclosure, the walls of which are made of bamboo poles; it is about 14 meters long, 4.5 meters wide and 4.5 meters high. The logs for charcoal are cut into lengths 1 meter shorter than the width of the kiln, and are corded up inside the kiln, leaving 0.5 meter space between the pile and the bamboo walls. Openings which run longitudinally along the floor of the kiln and up one end of the pile are provided for maintaining a draft. The space around the pile inside the walls is filled with fine charcoal waste and a cover of the same material is spread over the top. The fire is started at the lower end and gradually burns through the kiln, being retarded by the smothering effect of the charcoal cover. It requires anywhere from fifteen to thirty days to burn a kiln of 140 cubic meters of charcoal. The charcoal is obtained in unusually large pieces and is hard and strong, containing about 81 per cent. fixed carbon and about 3 per cent. ash.

To blow in a furnace, a slow fire is started in the crucible and allowed to burn for several hours, then charcoal is added until the crucible is filled and a light blast is applied. About twenty-four hours after the fire is kindled the blast is increased and a small quantity of ore together with more charcoal is charged at the top of the furnace. Increasingly larger charges are added at intervals until the operation is normal and the furnace is in full blast. Afterwards ore and charcoal are charged together at intervals of from one to five hours depending on the rate at which the iron comes down.

The average charge consists of 43 kilograms of charcoal and 25 kilograms of ore. The ore is broken into pieces with a maximum dimeter of about 2 centimeters. When the furnace is working normally, iron is tapped off every three or four hours.

As no flux is added to the charges, the clay lining of the crucible is quickly attacked and eaten away by the charcoal ash, so the smelting continues only as long as the furnace works well or until no more iron can be brought down, ordinarily for a period of from twelve to fifteen days. When siliceous ores are smelted the life of a furnace reaches to more than twenty-five days. The average capacity of furnaces is from 200 to 400 kilograms of metallic iron per day, all of which is made into plowpoints and plowshares. The castings produced are uniformly a white fine-grained iron, which is low in silicon, extraordinarily hard, and contains very little graphitic carbon. This should be expected with a furnace of such a short smelting column and with such a blowing equipment, capable of producing only a comparatively low temperature.

With the shortage of gray scrap and pig iron during the World War, greatly needed in local foundries, attention was directed to the possibility of producing gray iron from Philippine ores without entailing the expenditure of large capital. Improvement of the native practice was naturally suggested as a possible solution. After eliminating countless difficulties in the transaction, the Bureau of Science obtained the consent of Mr. Matias Fernando, a mine and smelting-plant owner of Angat, to carry out some experiments in his furnaces. The experiments were started by T. Dar Juan, F. Reyes, and myself with the introduction of a mechanical blower, which readily demonstrated its advantage over the hand blower by a slight increase of temperature in the hearth, an increase of output and a decrease of fuel consumption. Further changes, however, were needed and it was planned to introduce some means of preheating the blast and some changes in the furnace design, but funds were not available to carry out the experiments to a successful termination.

Mr. M. E. Heacock has organized the Manila Iron & Steel Company and erected in Bataan a small blast furnace with practically modern equipment. This place was selected because of the extensive fuel supply available from the Bataan forest. On account of high cost of transportation during its organization, the company planned to utilize in the meantime the magnetite sand which is found naturally concentrated along Limay and Mariveles beach bordering Manila Bay. It is to be regretted, however, that the postwar crisis paralyzed the activities of this company, a consequence to be expected in organizations of this nature starting with very limited capital.

The National Iron Company was created by the Government to establish an iron and steel industry in the Philippines. Mr. A. S. Argüelles, chemist of the Bureau of Science, was able to secure from reputable metallurgists and metallurgical concerns in the United States valuable comments on many important points to be considered in the organization and establishment of an iron and steel industry in the Philippines. Up to this time, however, nothing is known of the probability of materialization of the project.

Although during the last twenty years the agricultural and manufacturing industries in the Philippines have increased considerably, mining has advanced very slowly. With the progress of the above industries the demand for iron and steel products has shown a material increase, amounting to several millions of pesos annually. There exist in the Islands proved commercial deposits of iron ores, which could and should be developed and exploited to counterbalance the great wealth going out of the country annually.

The exploitation of the iron deposits could be effected either by exporting the ores to a neighboring metallurgical plant, or by establishing a smelter in the Islands. Japan and China may be considered as possible principal markets for Philippine ores, with New Zealand and Australia coming next. The problem of metallic iron production in the Philippines might be solved in two ways: blast furnace and electric smelting. The first requires a considerable supply of suitable fuel that can be produced at a very reasonable price; the second, though requiring only about one-third as much fuel, needs a great supply of cheap electric energy.

Chemical and Physical Characteristics of Philippine Ores

The question might arise as to the suitability of the Philippine ores for smelting. In Table 40 are given the analyses of samples taken from the important Philippine deposits. For the sake of comparison analyses of some foreign ores are also given.

TABLE 40.—*Analyses of Philippine iron ore.*

Constituent.	Bulacan ore.	Calambayanga ore.	Surigao ore.	Mayari ore, Cuba.	Magnetite from Hongkong.	Hematite, Mesabi Range, Minnesota.
Hygroscopic water ...	0.25	—	13.50	—	—	12.27
Combined water ...	—	—	6.60	11.15	—	—
Silica (SiO_2)	5.02	1.02	1.04	2.26	1.20	6.80
Alumina (Al_2O_3) ...	4.80	1.31	10.56	14.90	—	2.23
Ferric oxide (Fe_2O_3)	66.41	97.35	66.80	68.75	70.32	—
Ferrous oxide (FeO)	20.64	—	0.36	0.77	22.53	—
Lime (CaO)	0.35	—	—	—	0.60	0.32
Magnesia (MgO) ...	0.74	—	—	—	3.64	0.22
Manganese oxide (MnO)	0.24	0.11	—	—	1.48	—
Chromium oxide (Cr_2O_3)	—	—	1.15	1.89	—	—
Titanium oxide (TiO_2)	0.23	—	—	—	—	—
Nickel oxide (NiO) ...	—	—	None.	0.74	—	—
Phosphorus (P) ...	0.052	0.001	Trace.	—	0.004	0.062
Sulphur (S)	0.02	—	Trace.	—	0.11	0.07
Total iron (Fe) ...	62.54	64.14	54.29	48.65	66.75	58.83

The foregoing analyses show that the average iron contents of Philippine ores are well within the average smelting requirement. The ores from Bulacan and Calambayanga are much richer than those from Surigao, but the accessibility of the latter and the possibly lower mining cost are important points worthy of consideration. With the exception of a few samples, all are within the Bessemer limit as to phosphorus. Sulphur is variable, being high in some and low in other samples, but this element can be controlled by the furnace man.

It is important to note that alumina is high in proportion to silica, as compared with the iron ores most widely smelted elsewhere. This fact will perhaps require the production of high alumina slags, and will necessitate, besides the requisite amount of limestone, the increase of the silica in the ore by the addition of barren quartz.

In usual practice ores high in alumina are generally avoided due to the obscure rôle of alumina in the slags, but J. E. Johnson, jr., reports the successful experimental operation of a blast furnace, with perfectly satisfactory desulphurization, in which the alumina in the slag had been as high as 39.5 per cent. with silica as low as 21 per cent. on individual flushes and averaging for an entire day SiO_2 2, 24.7 per cent.; Al_2O_3, 36.0 per cent.; neutral substances (CaS, MnO, FeO, etc.), approximately 3.5 per cent.; and CaO, the remainder. Weld also states that, in connection with the high alumina and chromium content of the Mayari ores of Cuba, exhaustive studies and experiments on these ores have been carried out by the Pennsylvania Steel Company, and that it has been announced that all the difficulties have been solved, and steel rails of more than usual excellence, due doubtless to the nickel content, manufactured from them. It might, therefore, be conclusively stated that the special high alumina characteristic of Philippine iron ores does not exclude them from being smelted successfully. It may be superfluous to state that the character of the Surigao ores, except for the absence of nickel, is similar to that of the Mayari ores.

Titanium is present in some of the Bulacan ores but in quantities that would not affect the operation of a blast furnace or the grade of the iron produced.

The ores of Bulacan Province consist of magnetite and hematite in intimate mixture, but of varying proportion. Both minerals are usually massive, although some specular hematite is sometimes encountered. The Calambayanga ore is almost pure hematite with only traces of magnetite. The hematite is massive or granular, and the ore is moderately soft and very porous or vesicular. Therefore, from the peculiarities above described, the formation of fines in more or less considerable quantity might be expected, and these must receive preliminary treatment before being charged into a furnace. There are several processes of agglomerating ore fines, already known, involving the use or non-use of heat. It remains only for the operator to adopt the one that is most suitable and most economical in conjunction with the smelting-plant equipment.

The Surigao ore offers an entirely different problem. It is principally ferruginous clay, but contains also an abundance of small, round pellets of hydrous iron oxides, as well as fragments or crusts of the parent rock, much altered, porous, and iron stained,

but which maintain their original form. The ore is soft and very spongy, or mealy. In utilizing this ore, sintering or nodulizing is necessary, and some means of separating the intermixed fragments of country or other barren rocks will have to be provided.

Mining Costs

The present exploitation of the Bulacan deposits does not develop them at all ; nor has the work done on the Calambayanga revealed much as to the character of the deposit, which cannot be accurately determined owing to obscure geologic relations. It is, therefore, dangerous to advance at present any tentative estimate on the mining cost until more exploratory and development work has been done. Pratt and Dalburg noted that the walls of the ore bodies in Bulacan Province are invariably soft ; similar conditions are found in Calambayanga. Such conditions require a great deal of underground timbering, a very expensive item to add to mining costs in the Philippines. The Surigao deposit has been more or less thoroughly studied, and its mode of occurrence makes its mining less problematic than that of the former two ; an estimate of the cost could be fairly calculated after it has been decided what kind of excavating and transportation equipment shall be used.

Unless a smelter is built near the mines, the transportation of the ores from the mines to a place from which shipping can be made either to local or to foreign smelters is a problem that must be solved by the prospective operator.

The Bulacan deposits are isolated in a mountainous region, 50 kilometers or more from a railroad line. The Surigao and Calambayanga deposits are near to points that can be developed into good harbors, but the sharp relief offered by the regions will require considerable expenditure, especially as they are subject to the sudden formation of large streams during the rainy season. Aërial cable transportation will probably be the most convenient.

Labor is scarce in all three districts, as most of the people are engaged in agriculture and cannot be depended upon for continuous work in the mines. The timber supply in the districts is not abundant, either for fuel or for construction.

Fuel Supply

Deposits of coking coal suitable for blast-furnace use are found in Cebu and in Sibuguey, Mindanao. Exploitation has been started in these fields, but only on a small scale. Development of the coking seams is not very extensive and the probable available quantity is still unknown. It will take several years to place either one of the districts on a producing basis capable of supplying continuously a blast-furnace plant.

For a charcoal supply the extensive forests of Zambales, Bataan, Tayabas, Mindoro, Negros, and Mindanao might be pointed out. It will, however, be necessary to keep up the reforestation of the area selected, in order to insure future supply. To this end the use of ipil-ipil (*Leucaena glauca* Benth.) may be suggested, the wood from which makes a strong and hard charcoal.

Semianthracite is also being mined at Sibuguey, but like the other fields is still inadequately developed. This may be counted upon as a possible source of fuel supply for blast-furnace smelting.

Flux Supply

On account of the low silica content of Philippine iron ores, silica flux might be needed besides limestone. A good supply of both limestone and silica can be found near some of the ore deposits, all of which could be transported together with the ore. There exists, besides, a good supply of limestone and siliceous tuff near the coal mines of Cebu.

Power Supply

Power can be either steam or hydro-electric. For the use of the former the locations of fuel supply have already been mentioned ; for hydro-electric development the following are possibilities: Agus River draining the inexhaustible reservoir of Lake Lanao, in Mindanao ; Angat River in Bulacan Province ; and Agno River in Pangasinan Province. A report on the power possibilities of Agus River has been submitted by Chas. Bradshaw, formerly of the Bureau of Public Works, and is in the files of that bureau. Seven possible power sites are mentioned, with heads varying from 160 to 400 feet, and the total available power is about 300,000 electric horse power, at a cost, estimated on prewar conditions, of from 40 to 90 pesos per electric horse power installed. General C. de las Heras, in a paper read before the Manila Merchants' Association in May, 1912, described several ways of developing hydraulic power in Angat River, and he estimated that 11,400 electric horse power could be developed at a cost of about 4,500,000 pesos. The Bureau of Public Works has at present under study the possibility of developing Agno River, which is said to be capable of furnishing 1,000,000 horse power.

Smelting Process

It has been mentioned before that either blast furnace or electric smelting could be adopted for the production of metallic iron. Granting that there is an abundance of good iron ore and fuel and a possibility of developing cheap hydro-electric energy, the commercial success of either process will depend on the possibility of continuous operation. It has been pointed out that Japan, China, New Zealand and Australia are possible markets for Philippine ores ; the same may be said in connection with marketing the pig and other iron products. The advisability, however, of counting upon these countries indefinitely as markets for Philippine iron is not commercially sound, because all of them have already started in the iron industry themselves, and Japan and China have, each and together, extensive programs for developing the iron deposits on the Asiatic Continent. To be conservative, therefore, it would be advisable to depend only upon home consumption in the estimation of smelting-plant capacities.

The total imports of iron and steel and their various manufactures amounted to 37,575,421 pesos in 1920, 38,621,929 pesos in 1919, 22,464,508 pesos in 1918, and 10,023,155 pesos in 1917.

TABLE 41.—*Showing the most important iron and steel products imported into the Philippine Islands during 1920 and their quantities and values.*

Article.	Quantity. *Kilos.*	Value. *Pesos.*
Pig iron	2,149,201	170,385
Bar iron	524,320	107,549
Bars or rods of steel	14,486,984	2,842,005
Railroad materials	22,451,041	3,196,580
Corrugated roofing	4,324,336	1,741,230
All other sheets and plates	3,470,774	984,748
Structural iron and steel	7,138,851	1,711,891
Wires and cables	2,578,901	1,133,125
Nails, spikes, and tacks	2,402,863	682,071
Needles, nuts, bolts, washers, rivets, screws, and tools	—	3,239,926
Pipes and fittings	4,387,395	1,602,384
Total	63,914,666	17,411,894

It will be noticed that the local demand for pig iron is very small, and any project for establishing a smelting plant will have to be developed along the lines of greater demand. Were the capacity of a plant based on the total iron imported, it would require a daily output of about 200 metric tons of iron, operating 350 days in a year. The operating cost of a blast furnace of this capacity is not very economical, being comparatively higher than a furnace of two-or three-fold capacity. With a more conservative figure, say 100 metric tons or less per day, the disadvantage of a blast-furnace plant will become more apparent.

The increasing use of electric furnaces for production of steel of different kinds, and the adaptability of such furnaces to electric ore smelting make their use more convenient and perhaps more economical than the operation of blast furnaces, especially when a very small daily capacity is to be considered. Of course, the development of hydro-electric power will entail considerable initial capital ; yet, bearing in mind the amount of capital to be invested to develop and to keep up the exploitation of a fuel supply in order to insure continuous operation of a blast furnace, the advantages will still be in favor of the electric furnace ; primarily, because the amount of capital to be invested in the development of a hydro-electric plant can be fixed, or closely estimated, while the capital needed in the exploitation of coal will vary greatly according to conditions that can only be determined after considerable development work ; second, because the price of electric energy can be calculated from the start, while the mining costs of coal will depend on labor and underground conditions, which are very variable factors ; and, third, because the extent of the Philippine coking coal supply is not yet definitely known, while the hydraulic power resources have already been studied. Another point worthy of consideration is the fact that, if Agno River is developed, not only the iron industry will be benefited but also the gold mining of Benguet, the manufacturing industries of Manila and, incidentally, the agriculture of the intervening provinces.

The Technical Fair in Leipzig

13 large exhibition halls—A " street of nations " planned

WE may maintain without all exaggeration that the Leipzig Technical Fair, famed far beyond the German frontiers, is in its own way perfectly unique. Only he who has actually seen this Fair with his own eyes and experienced it can have any real conception of the *importance* and *extent* of this enormous Fair. An opportunity of attending it is offered *twice a year*, in Spring and Autumn. As the Technical Fair is absolutely *international*, all countries naturally take a lively interest in it. Non-German states regularly send their agents, either to exhibit the Products of their country or to make favourable purchases. The advantages of such a visit are not to be underestimated. The visitor has the chance of transacting business in one place, in the shortest time, with the minimum of experditure and the maximum of comfort. He also gets a comprehensive idea of the latest technical achievements. Imposing character of the Technical Fair is evident in its *interior arrangement*—everything within the range of technics raw materials, semi-manufactures, and ready-made goods, *all the technical branches of industry* are represented—and also in its *external construction*. 13 mighty halls, among them the machine-tool hall with an exhibition and traffic space of 21,000 square metres, cover part of the area which is traversed by broad roads and adorned by beautiful gardens. The Leipzig Technical Fair, which already occupies a surface of 360,000 square metres, goes on steadily developing. Among other projects a " street of nations " is planned, where non-German states can exhibit collectively in halls of their own the products of their own country, other halls are also planned to supplement those already standing. The official statistics as to the number of visitors show what intense interest is taken on all sides in this world-market place. No fewer than 180,000 interested visitors attended the last Leipzig Spring Fair. Of these 18,000 were foreigners. There were 14,000 exhibiting firms. So Leipzig has become more and more the point of attention and the meeting-place of exhibitors and buyers from every civilized country. The approaching *Technical Spring Fair of 1926*, which has been still further improved, is sure to be thronged by visitors. It will last from *February 28 till March 10*.